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Wright et al.

(10) **Patent No.:** **US 9,056,186 B2**
(45) **Date of Patent:** **Jun. 16, 2015**

(54) **UNIVERSAL CATHETER SECUREMENT
DEVICE**

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(*) Notice: Subject to any disclaimer, the term of this
patent is extended or adjusted under 35
U.S.C. 154(b) by 400 days.

(21) Appl. No.: **13/363,285**

(22) Filed: **Jan. 31, 2012**

(65) **Prior Publication Data**

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Related U.S. Application Data

(63) Continuation of application No. 12/601,360, filed as
application No. PCT/US2008/065364 on May 30,
2008, now Pat. No. 8,105,290.

(60) Provisional application No. 60/941,647, filed on Jun.
1, 2007.

(51) **Int. Cl.**

A61M 5/32 (2006.01)

A61M 25/02 (2006.01)

(52) **U.S. Cl.**

CPC **A61M 25/02** (2013.01); **A61M 2025/024**
(2013.01); **A61M 2025/0246** (2013.01); **A61M**
2025/0266 (2013.01); **A61M 2025/028**
(2013.01)

(58) **Field of Classification Search**

CPC **A61M 25/02**; **A61M 25/01**; **A61M**
2025/0206; **A61M 2025/0246**; **A61M**
2025/028

USPC **604/174–180**; **606/108**

See application file for complete search history.

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Primary Examiner — Bhisma Mehta

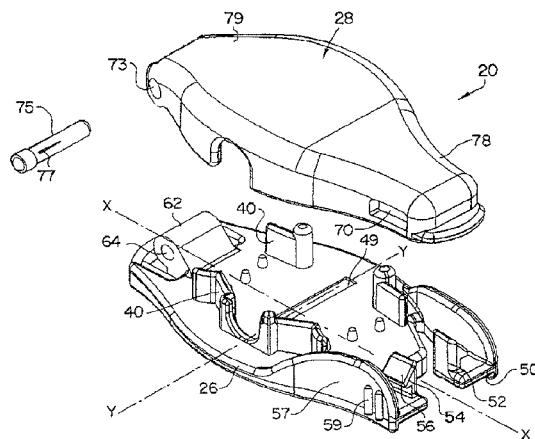
Assistant Examiner — Bradley G Thomas, Jr.

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(57) **ABSTRACT**

A universal device for securing a catheter on a patient includes a base which optionally has one or more locating elements for positioning or securing a catheter or catheter fitting of various shapes or sizes. The base optionally includes a recessed or flat receiving area defined by locating elements arranged to hold or receive a catheter or catheter fitting. Additional locating elements may be positioned elsewhere for receiving or holding a flange or wing of a catheter fitting. A cover is removably or permanently connected to the base and may optionally have one or more top openings for receiving tabs or extensions of a catheter fitting. The cover may optionally include one or more capture ridges for restraining a catheter or catheter fitting of various shapes or sizes on the base or on the retention plate. The cover may also include one or more tabs or contact bars.

19 Claims, 58 Drawing Sheets



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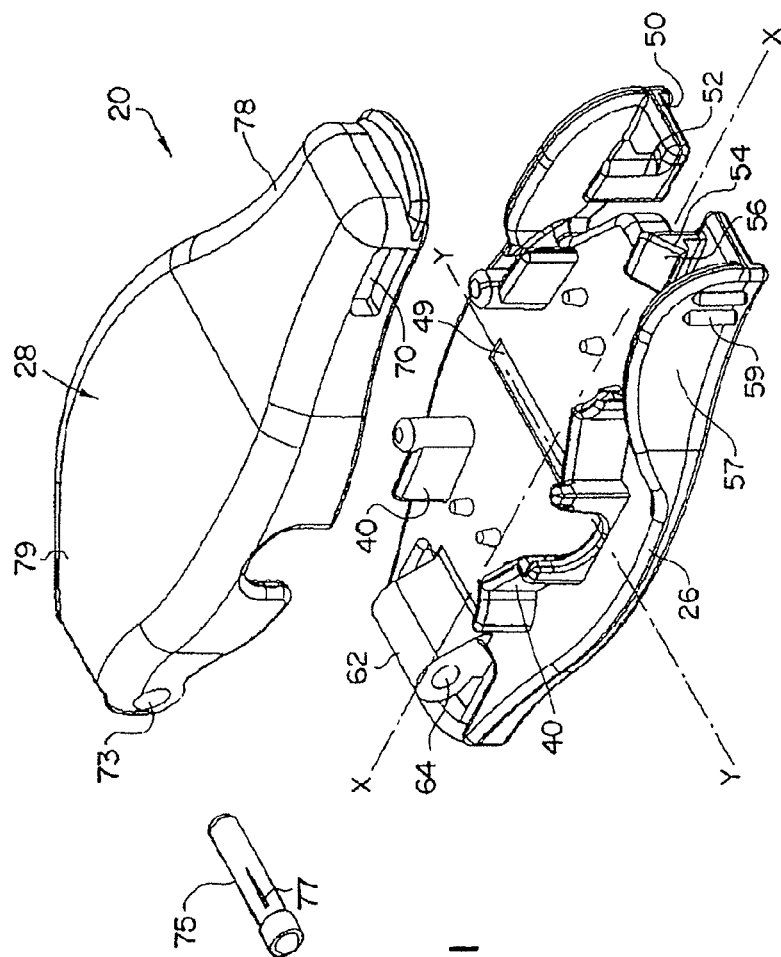
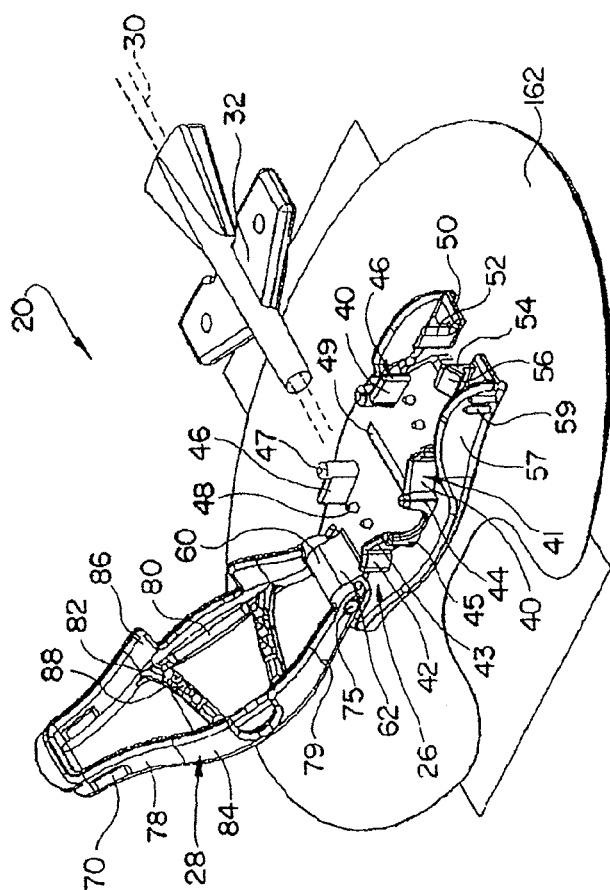
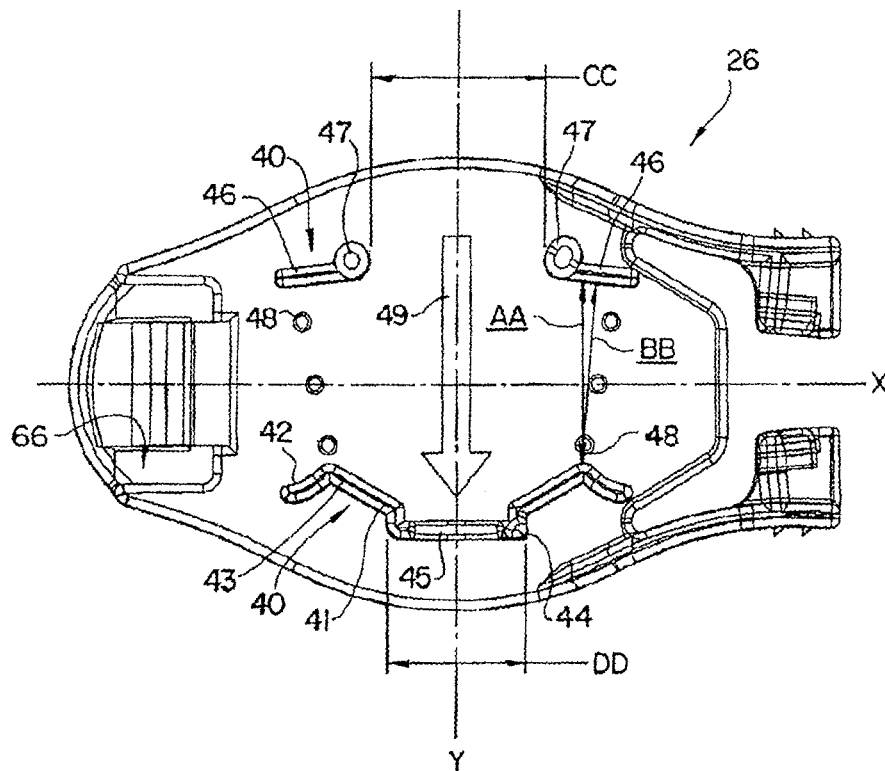


FIG. 1



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FIG. 3



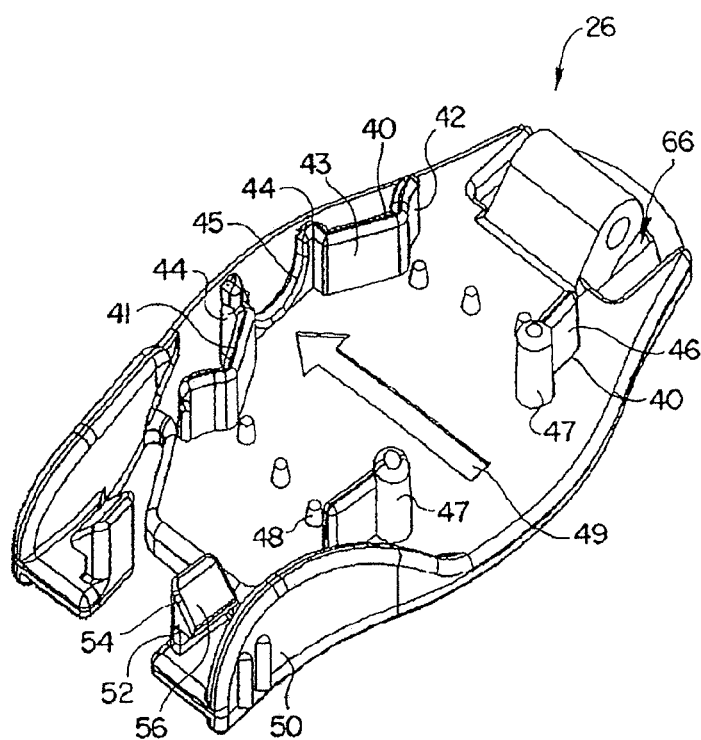


FIG. 4

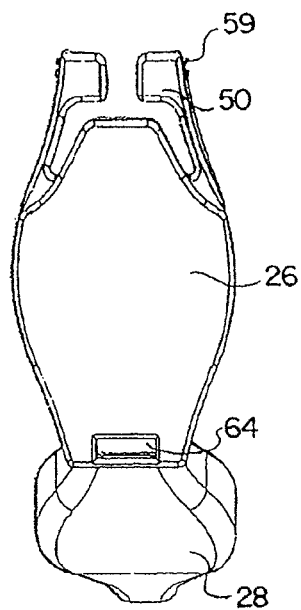


FIG. 5

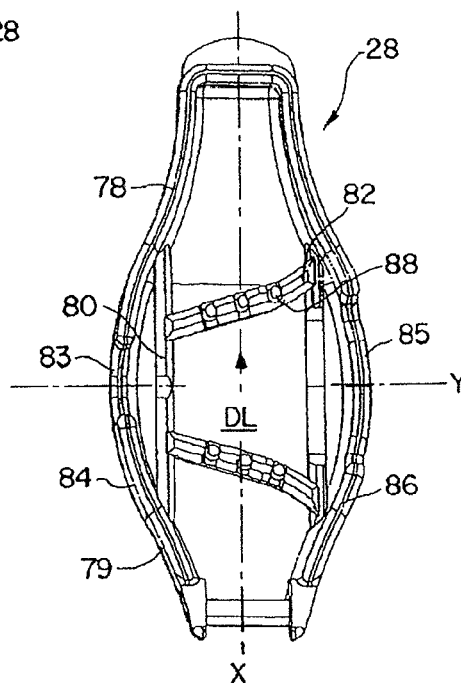


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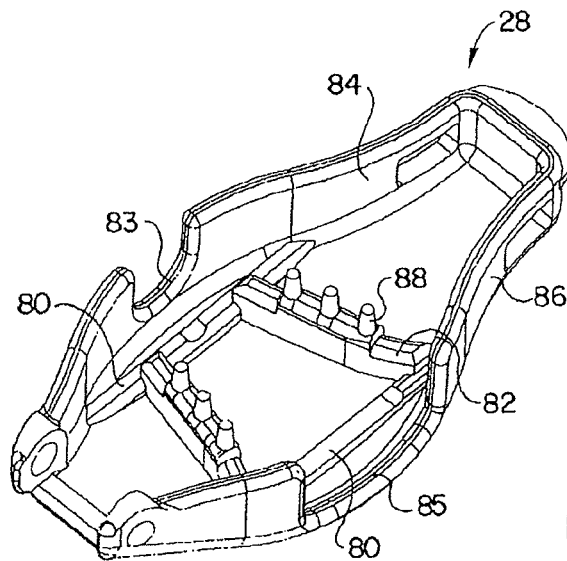


FIG. 7

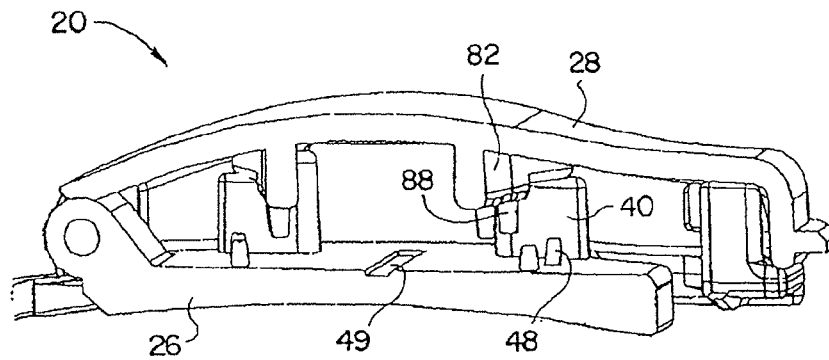


FIG. 8

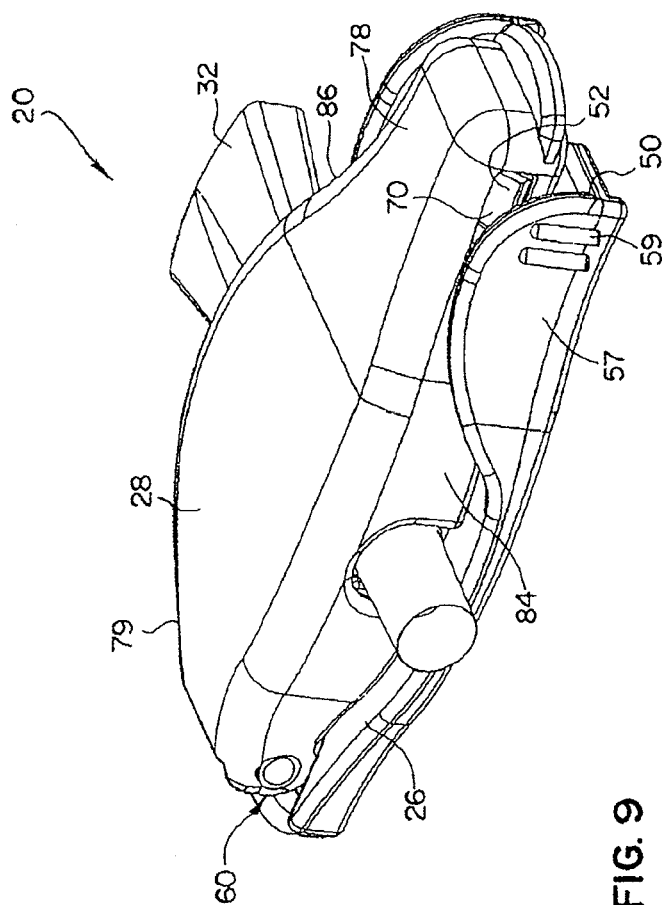


FIG. 9

FIG. 10

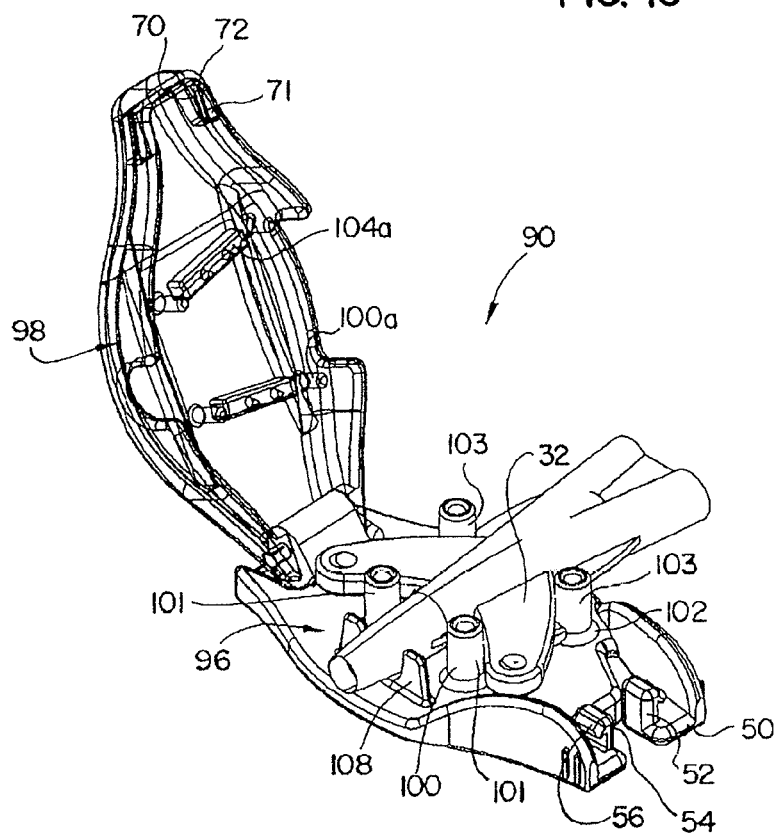


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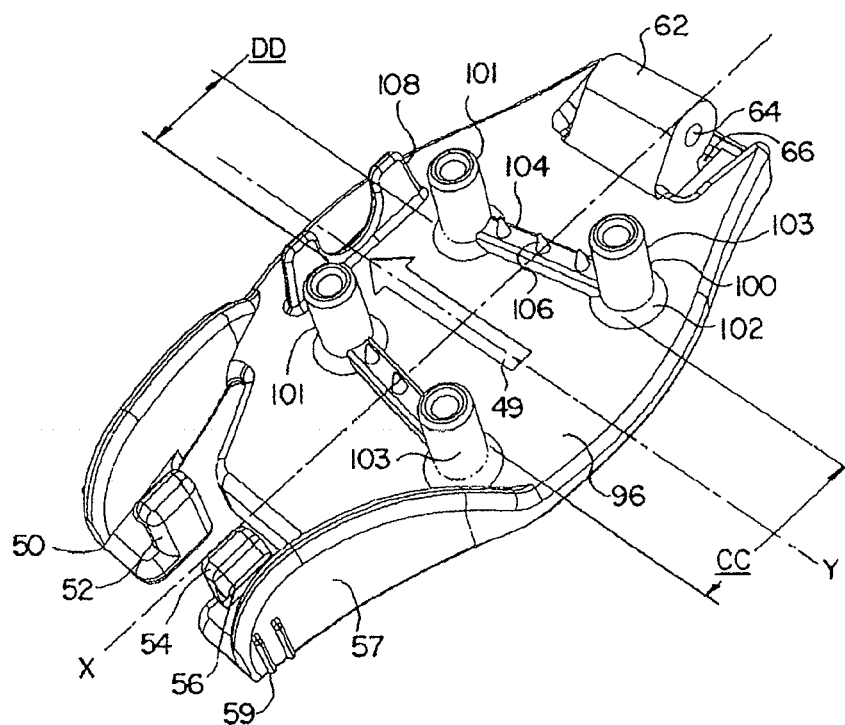


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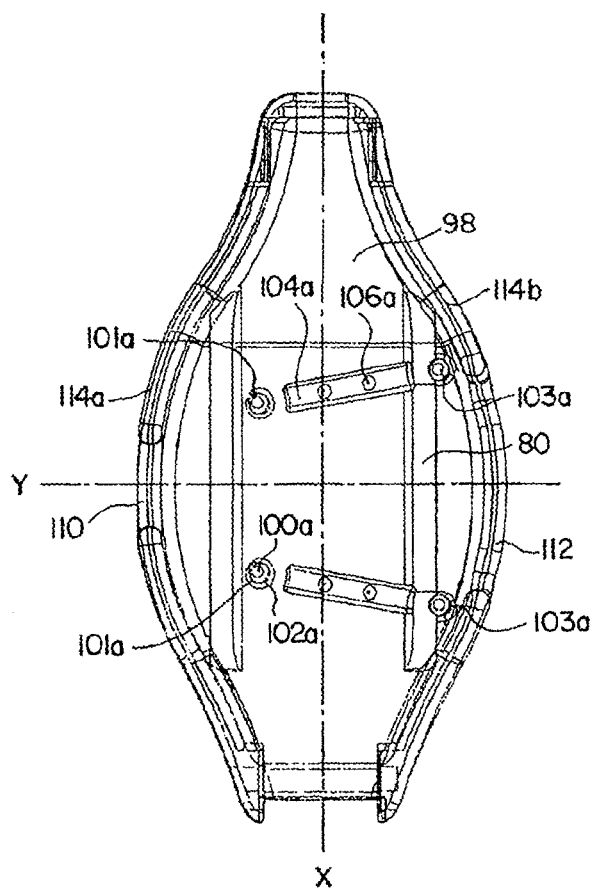
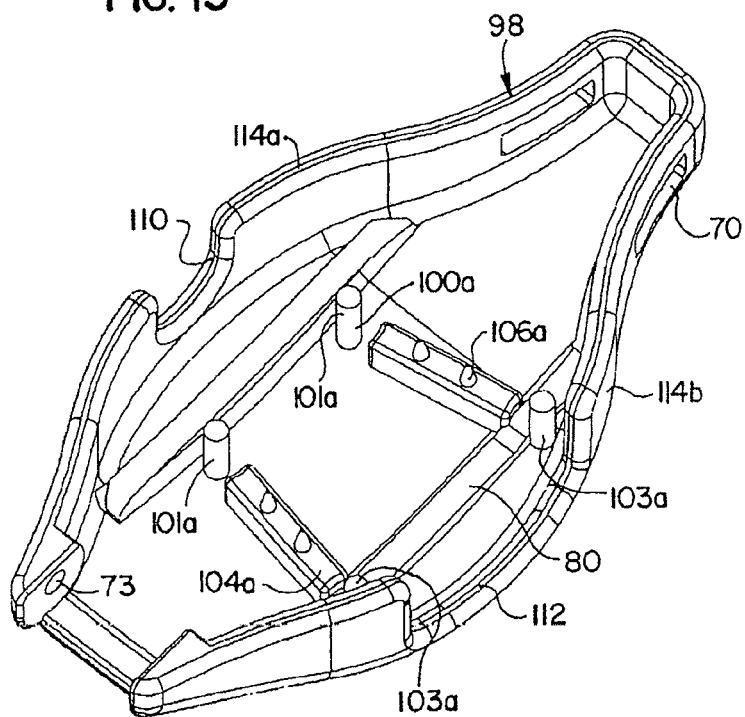
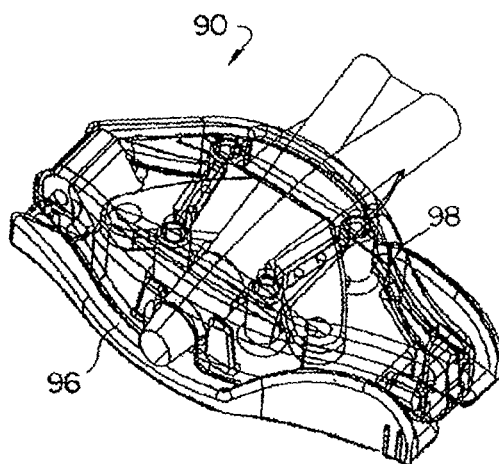
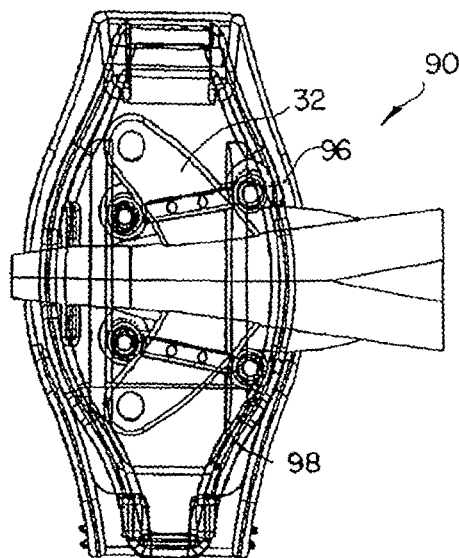


FIG. 13





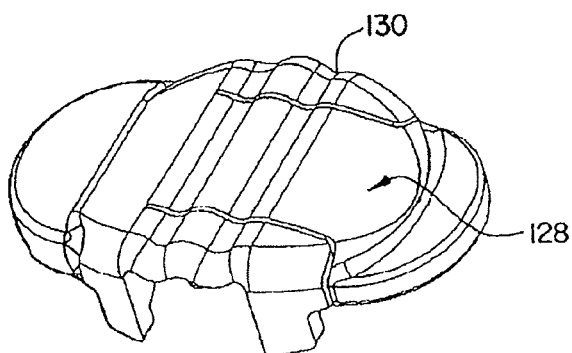


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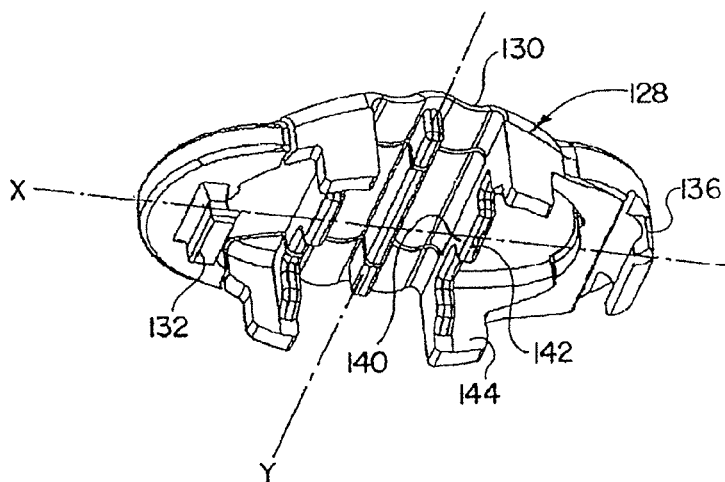


FIG. 17

FIG. 18

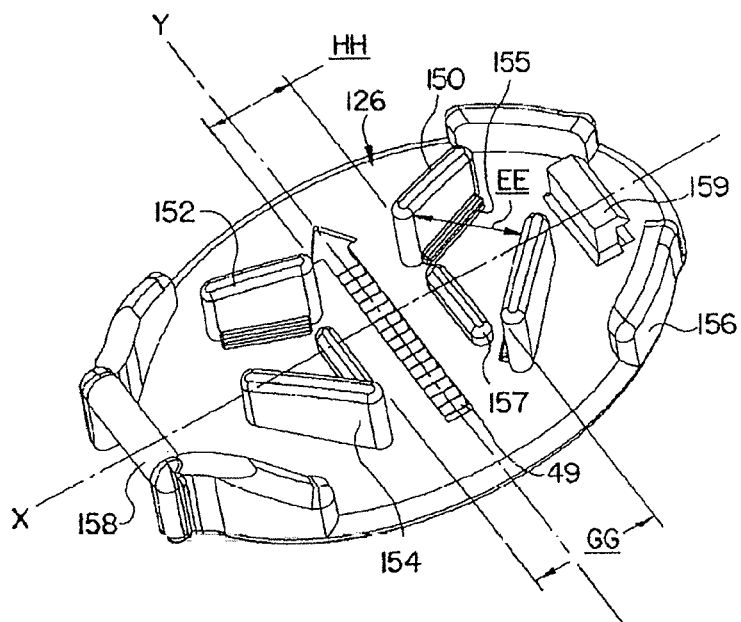
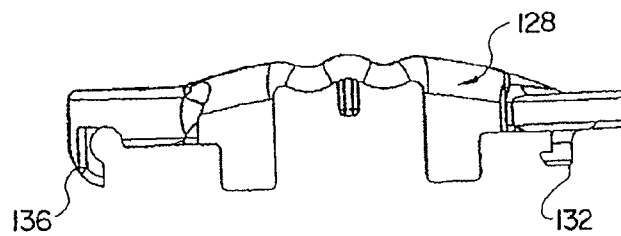


FIG. 19

FIG. 20

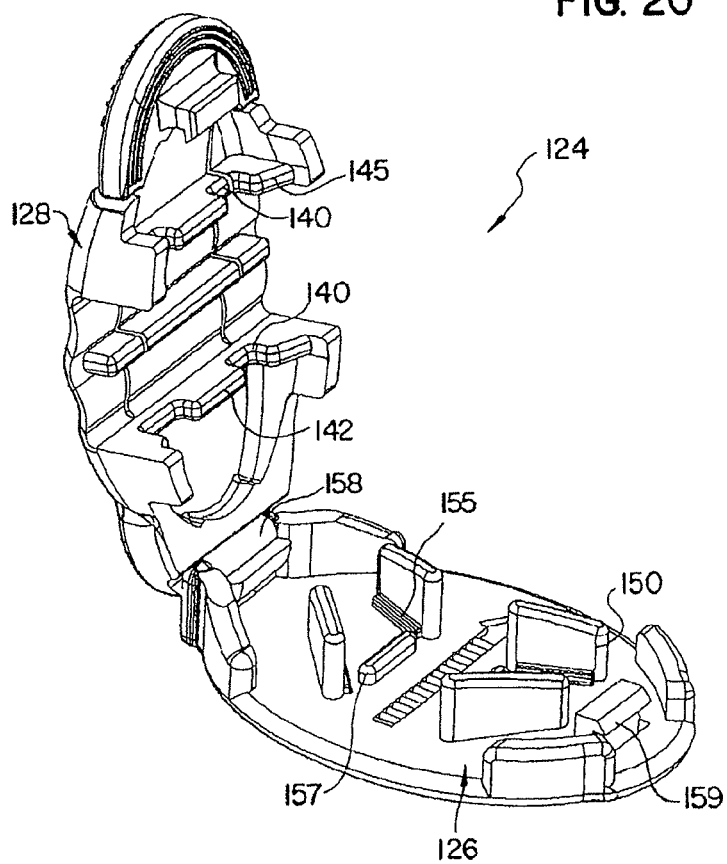
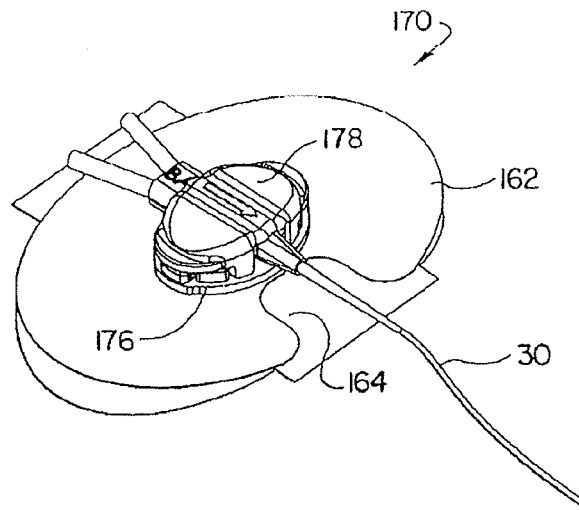


FIG. 21



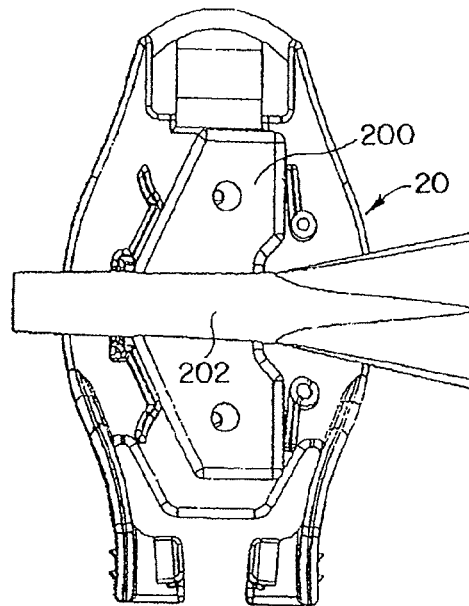


FIG. 22

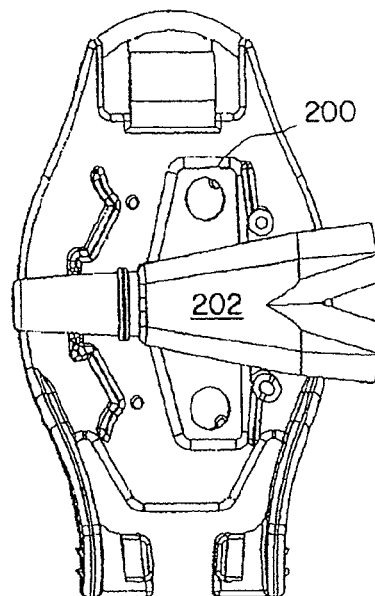


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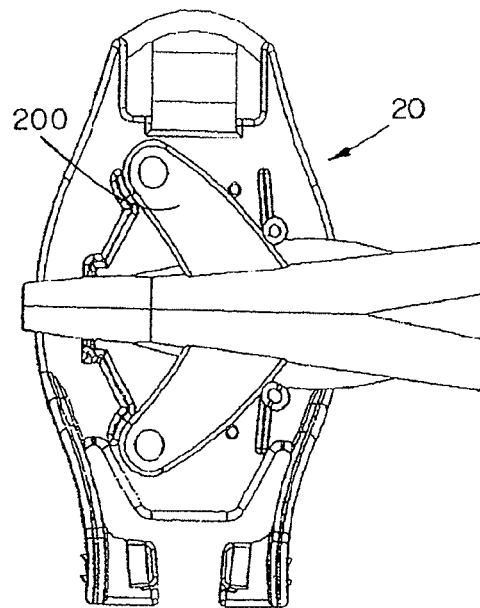


FIG. 24

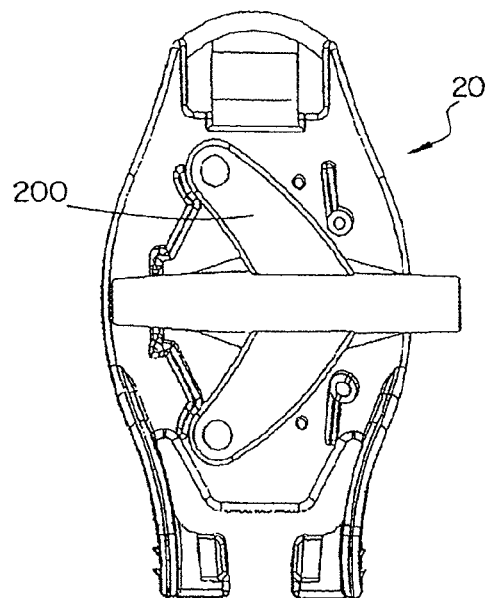
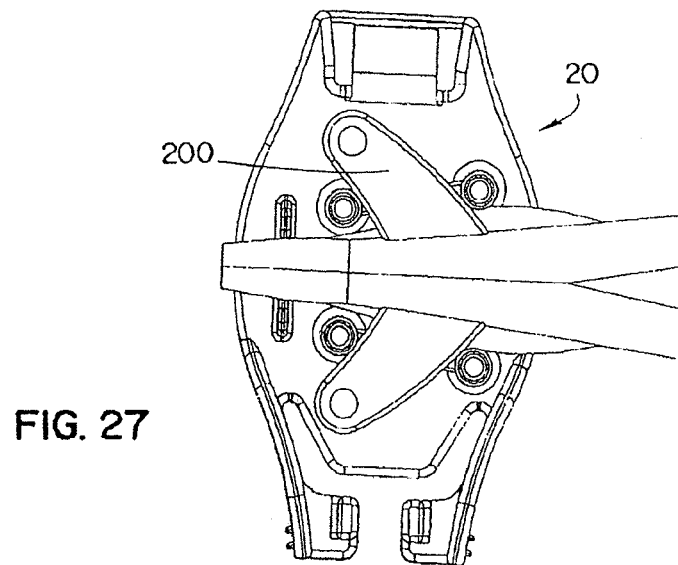
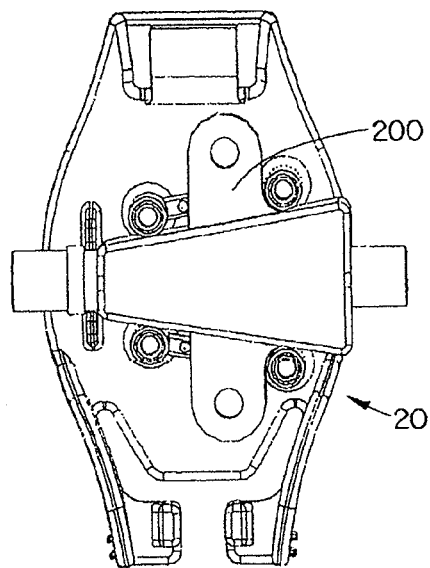
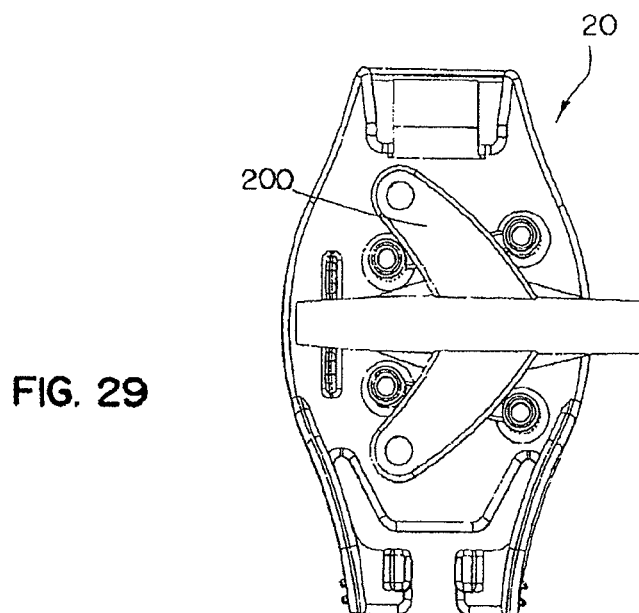
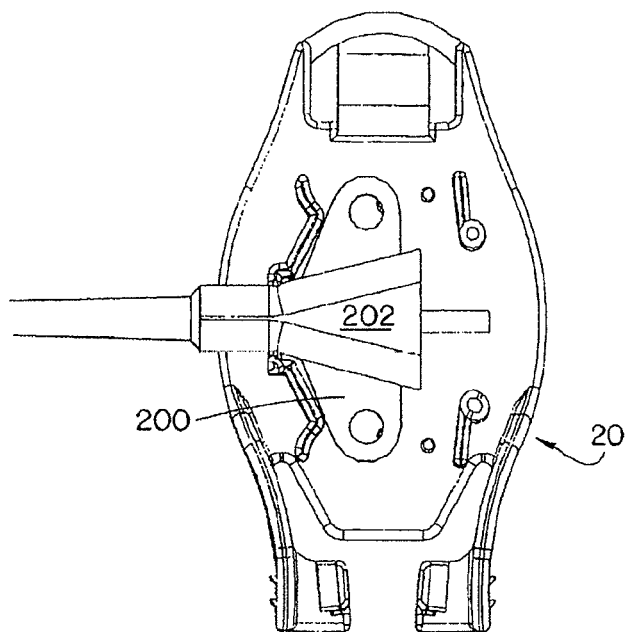


FIG. 25





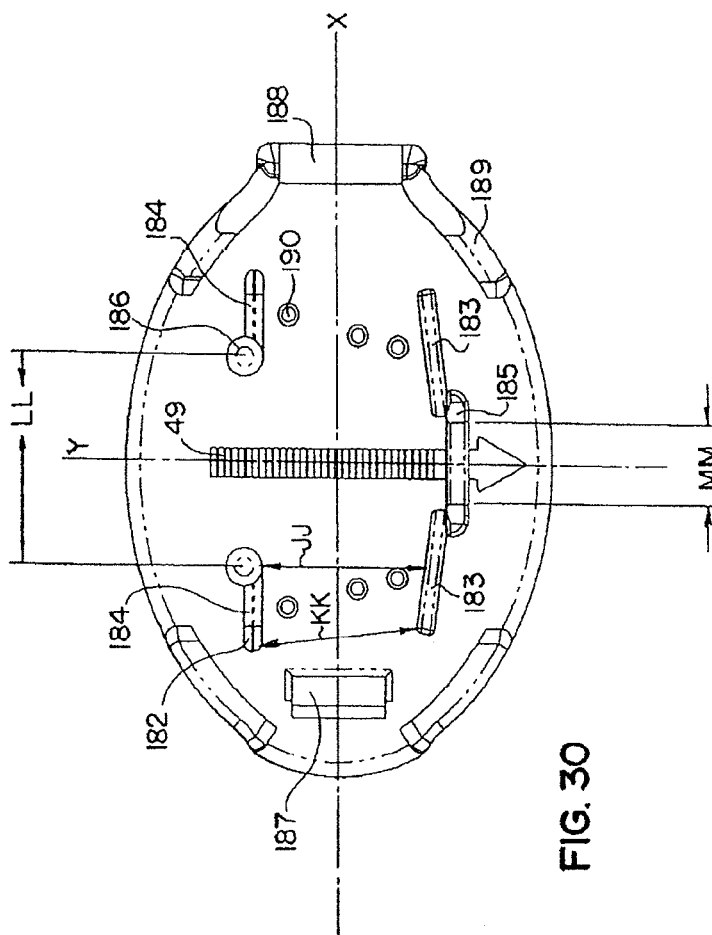


FIG. 30

FIG. 31

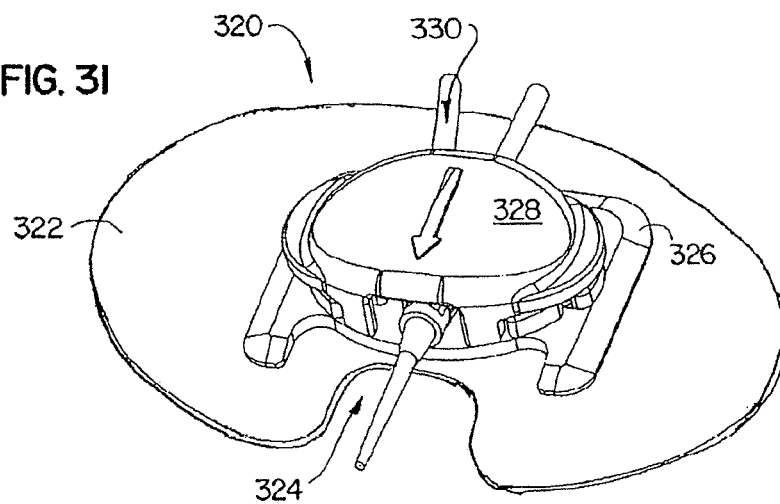


FIG. 32

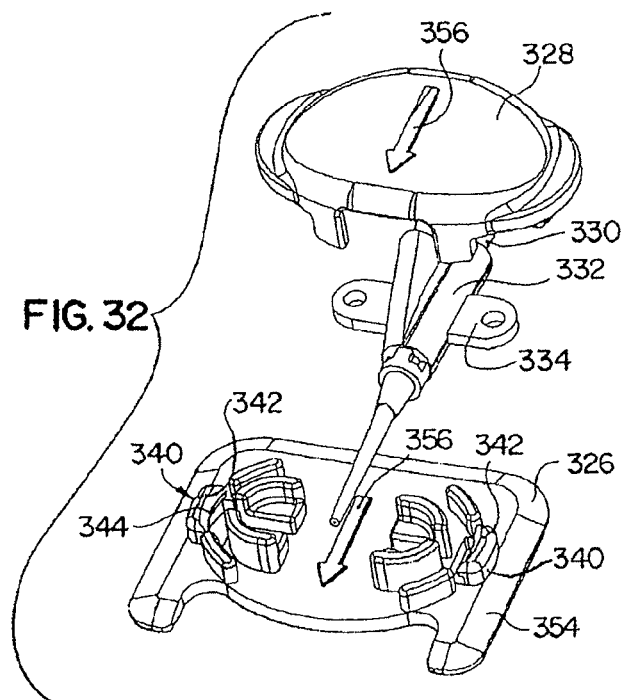


FIG. 33

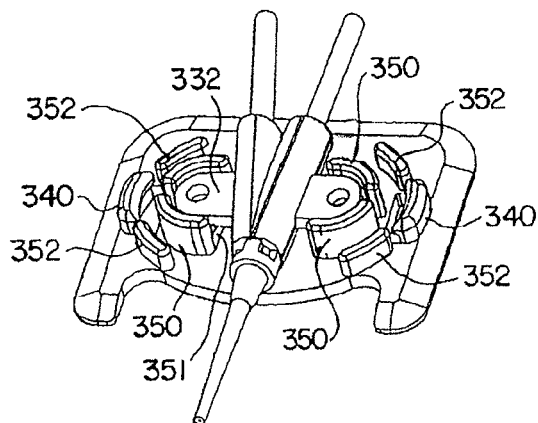


FIG. 34

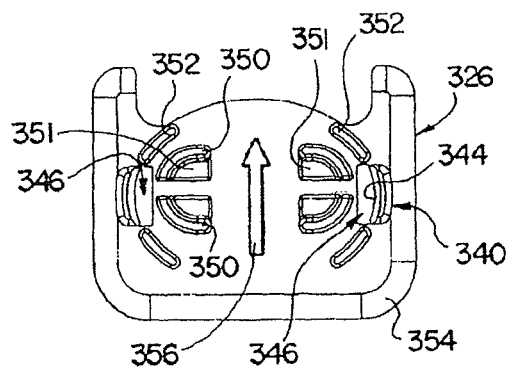


FIG. 35

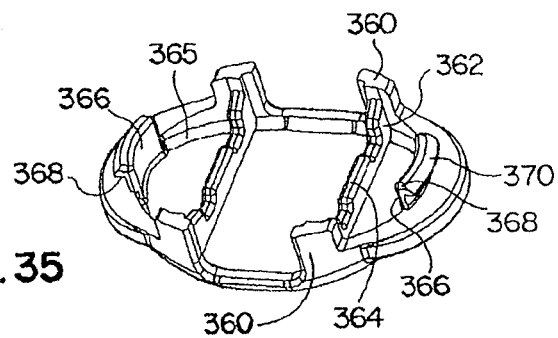


FIG. 36

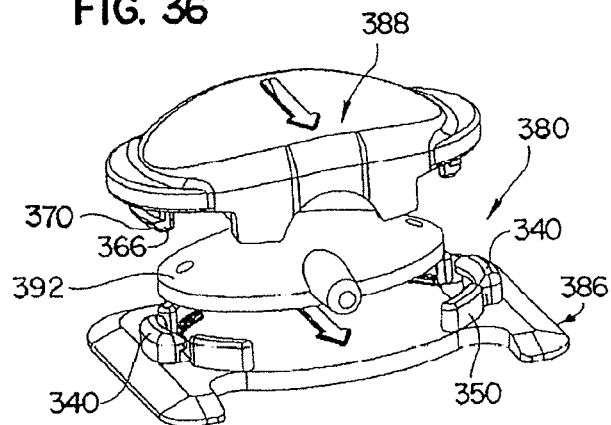


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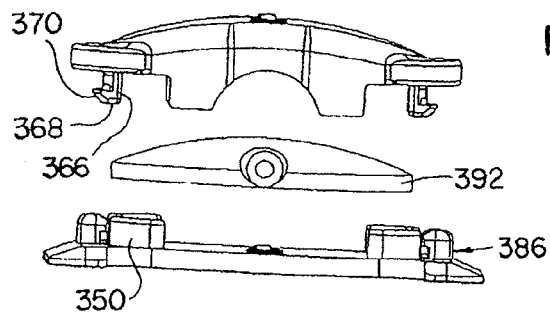
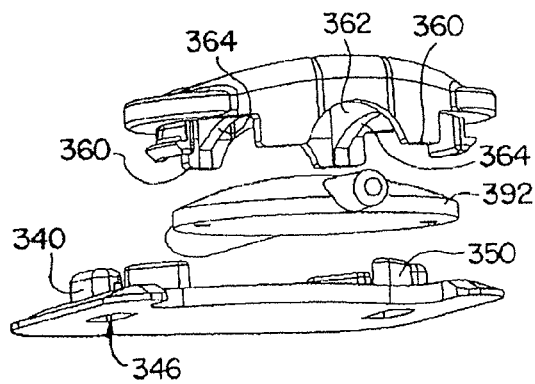


FIG. 38



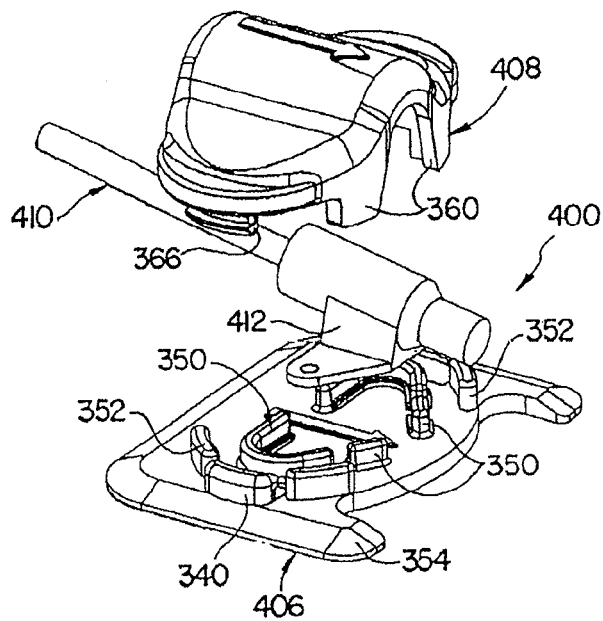


FIG. 39

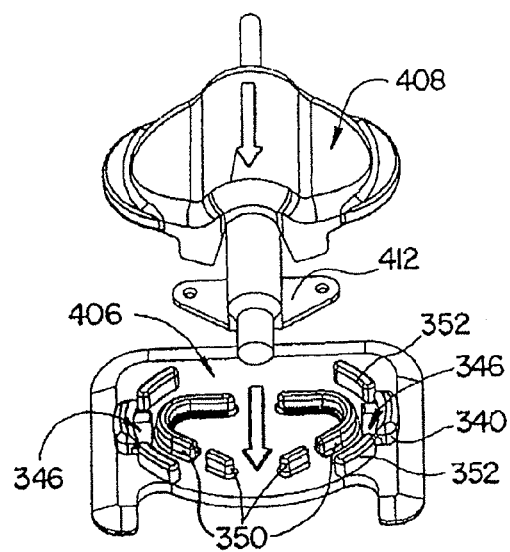


FIG. 40

FIG. 41

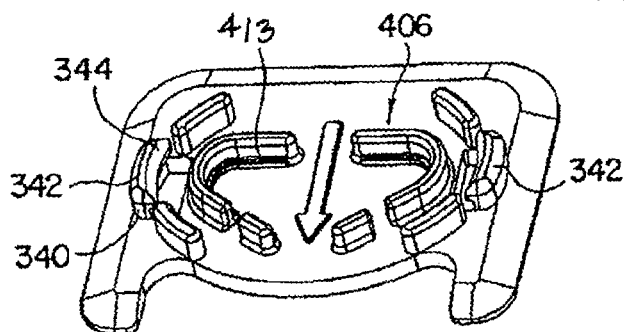
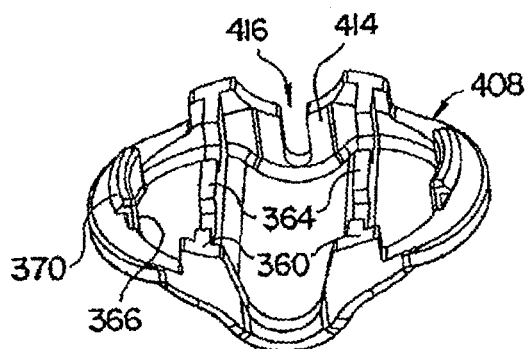


FIG. 42



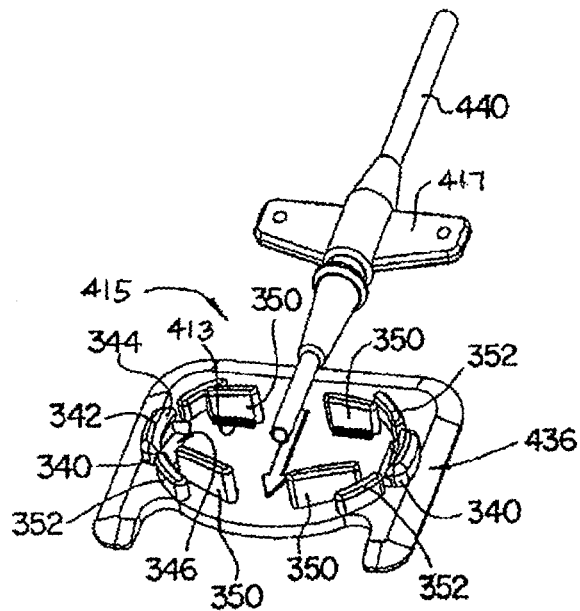


FIG. 43

FIG. 44

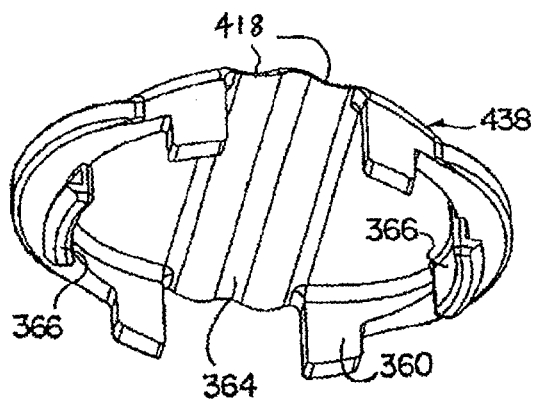
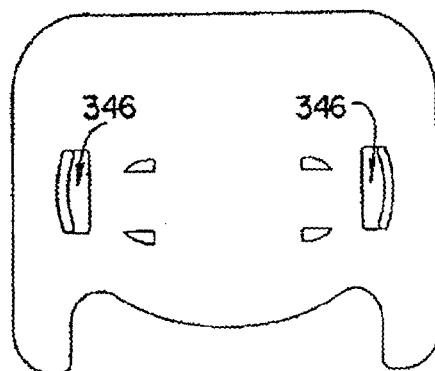


FIG. 45

FIG. 46

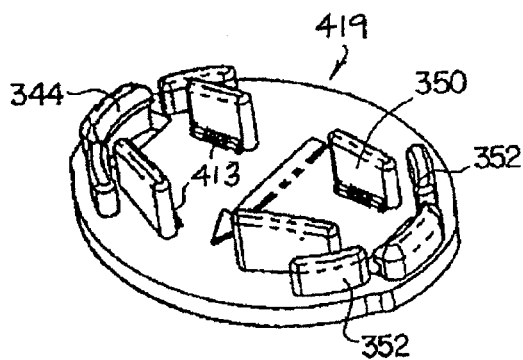
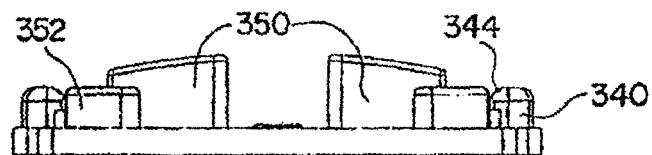


FIG. 47



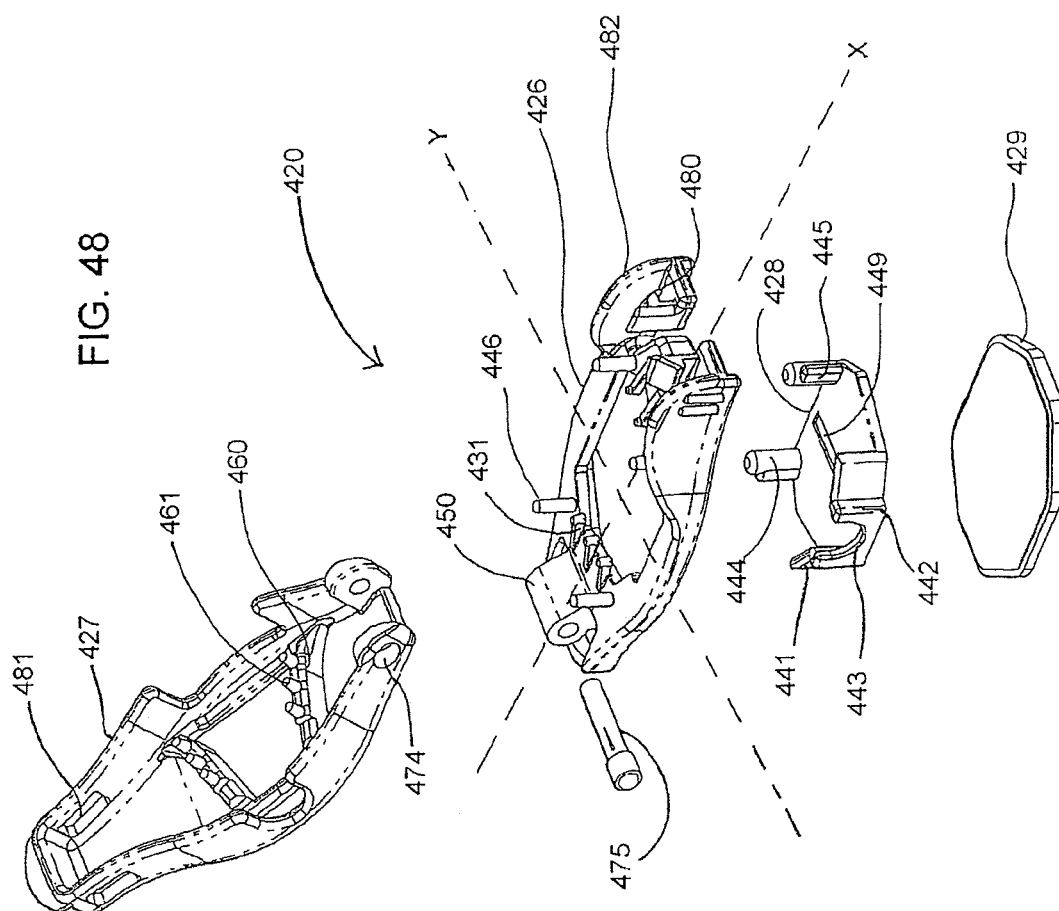


FIG. 49

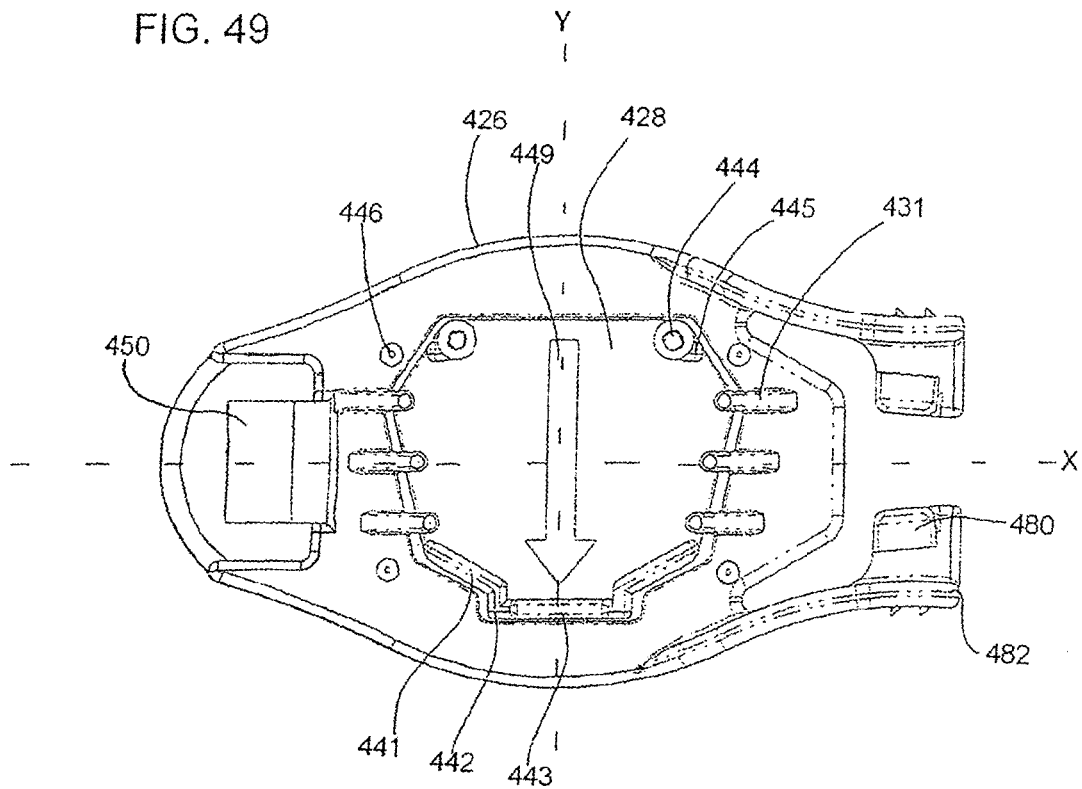


FIG. 50

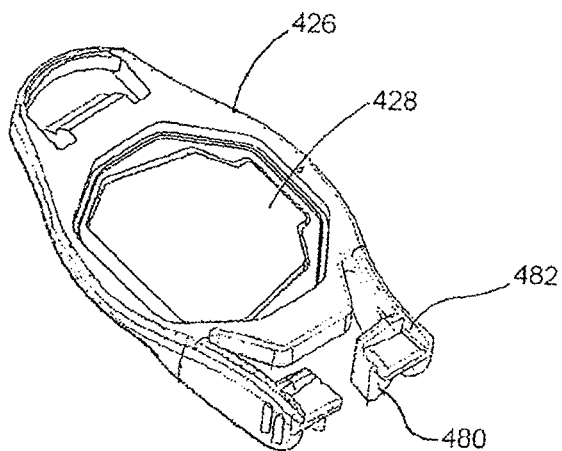


FIG. 52

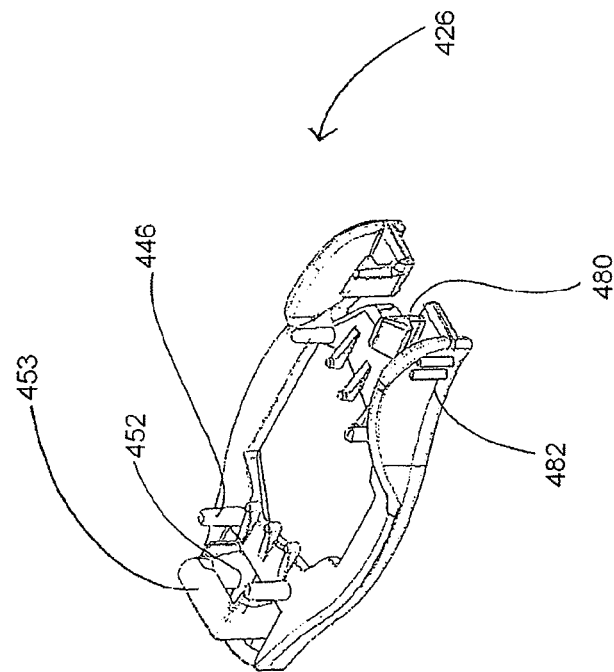


FIG. 53

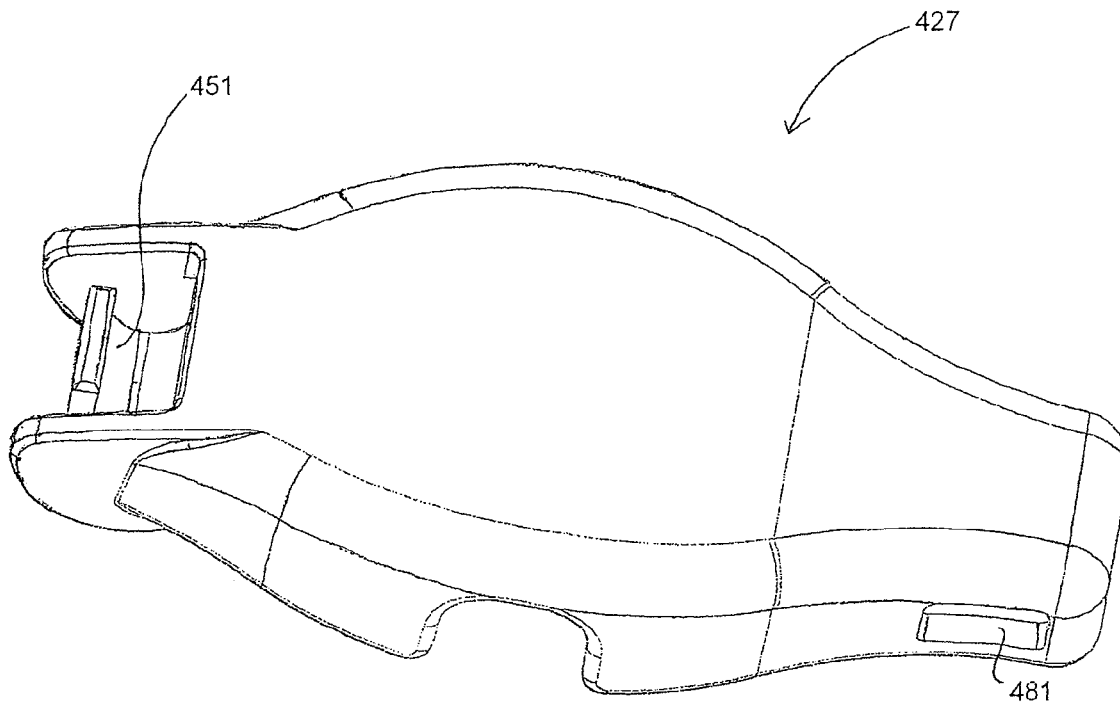


FIG 54

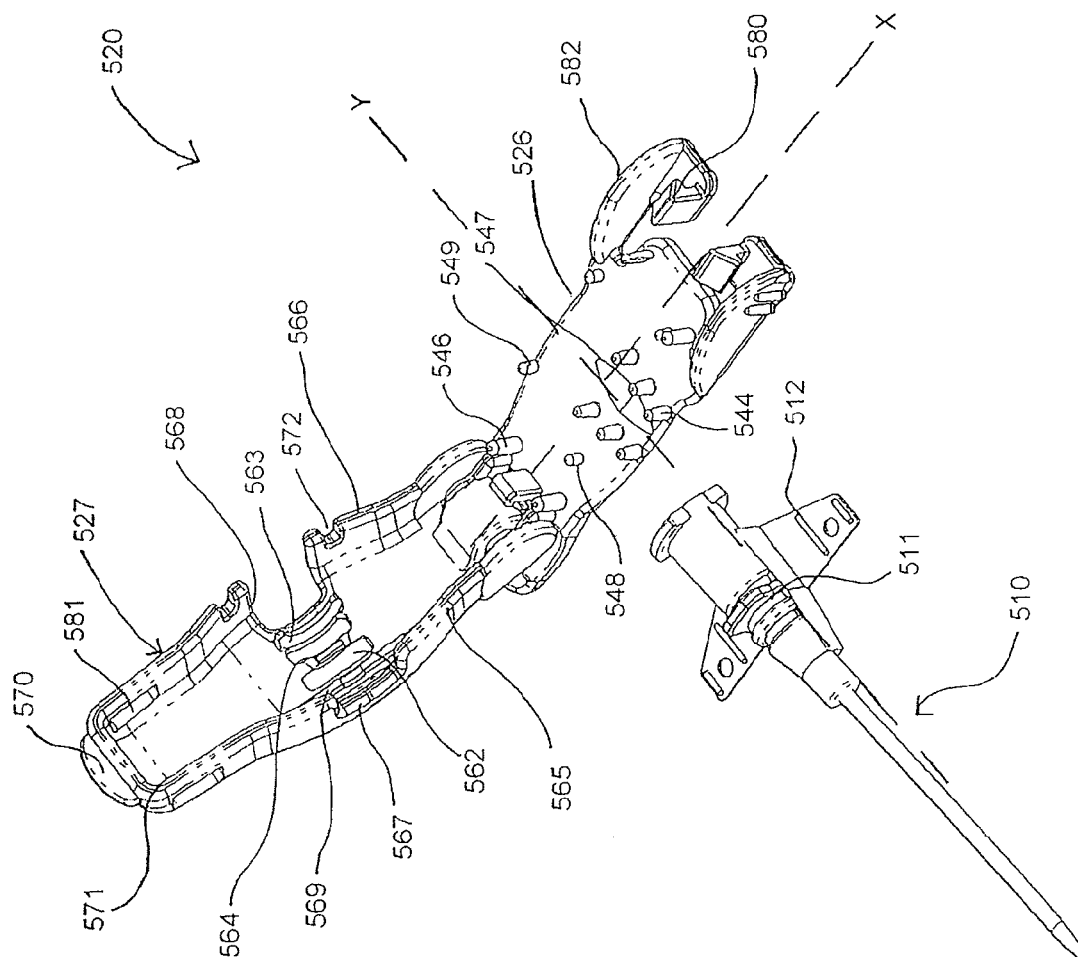


FIG. 55

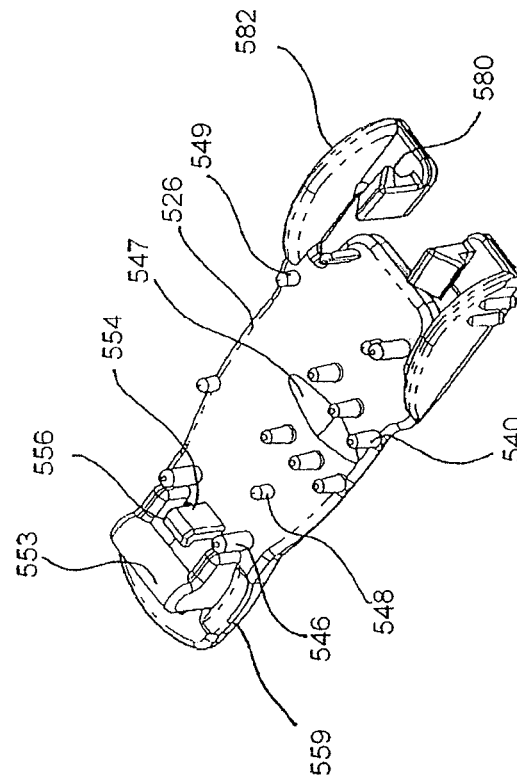


FIG. 57

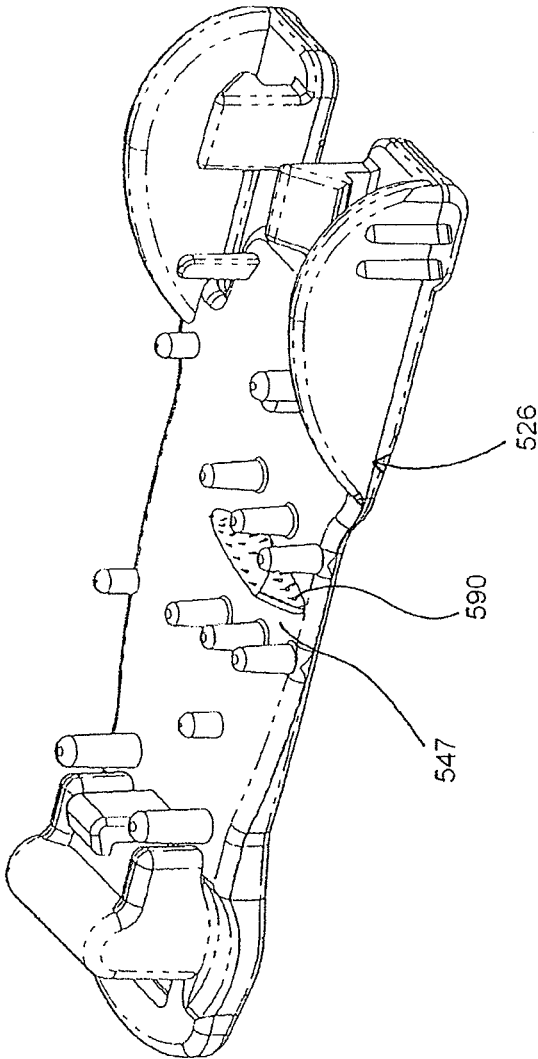


FIG. 58

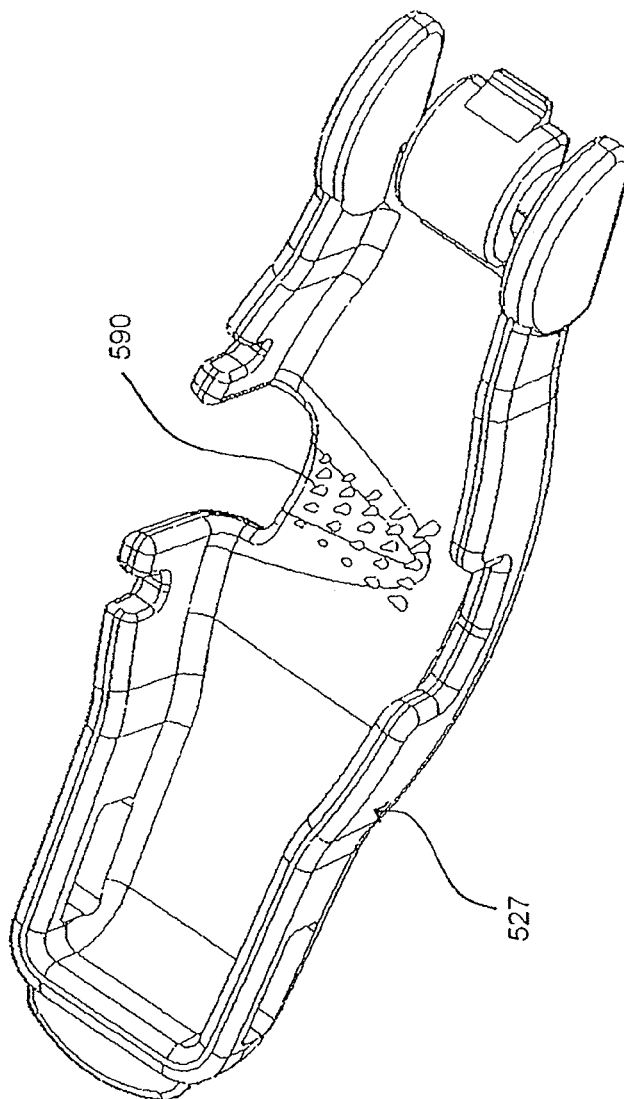


FIG. 59

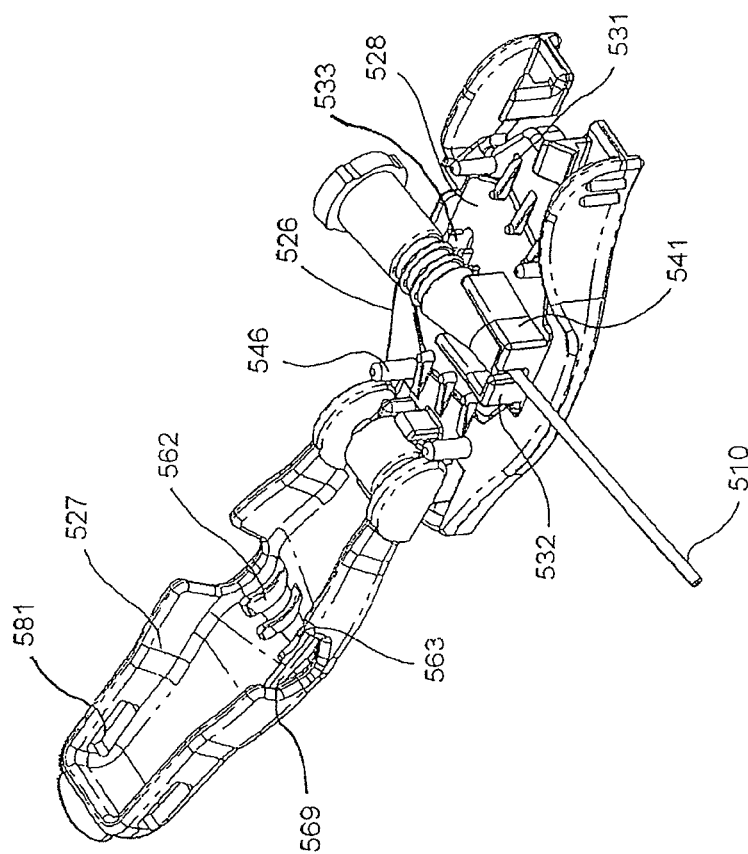


FIG. 60

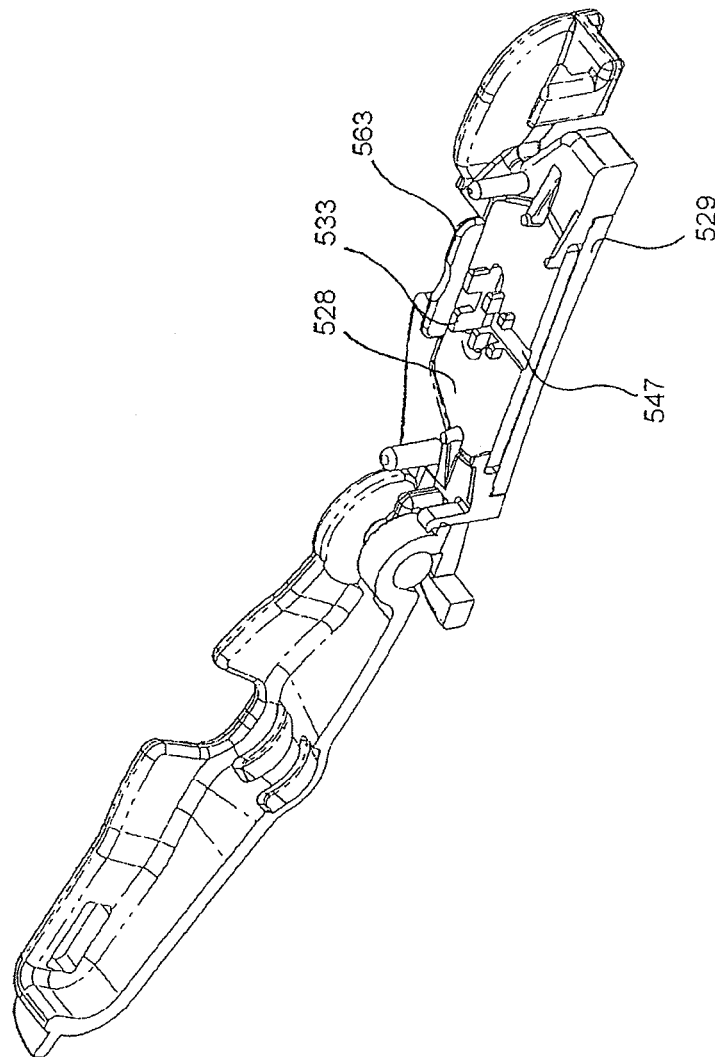
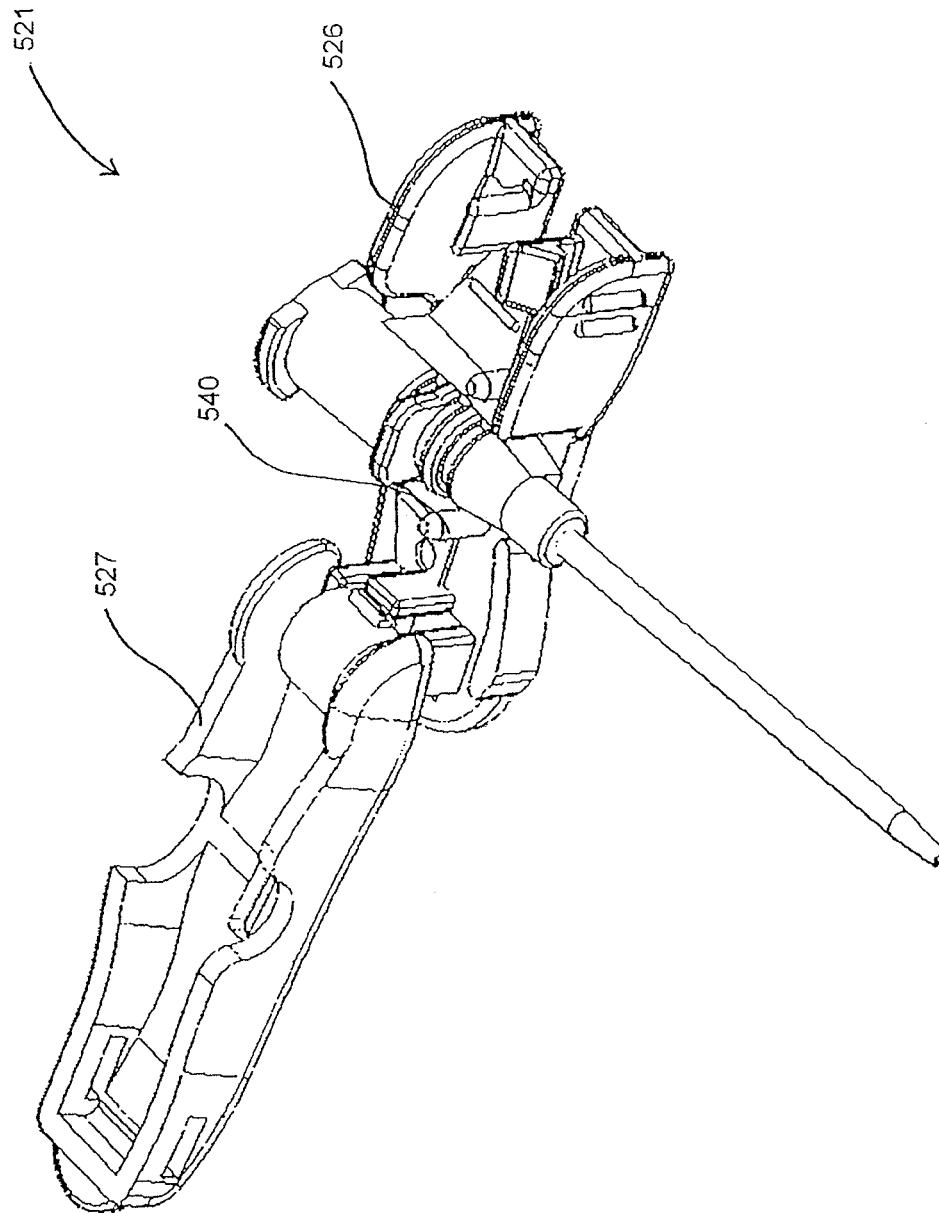


FIG. 61



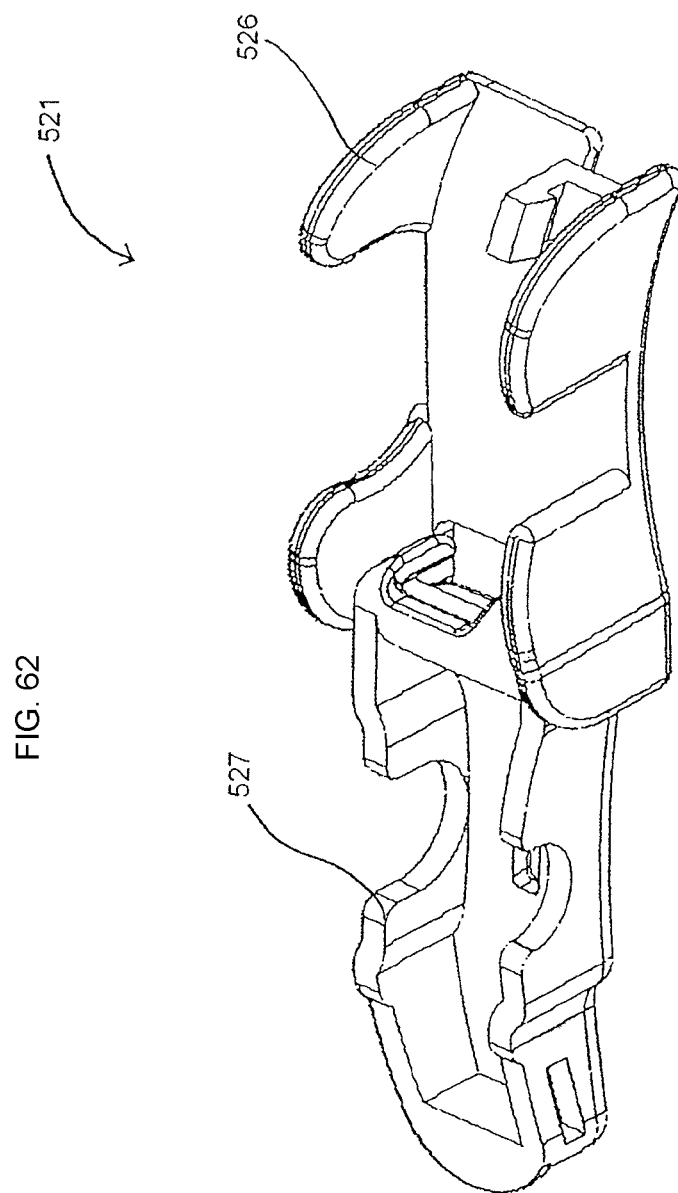


FIG. 63

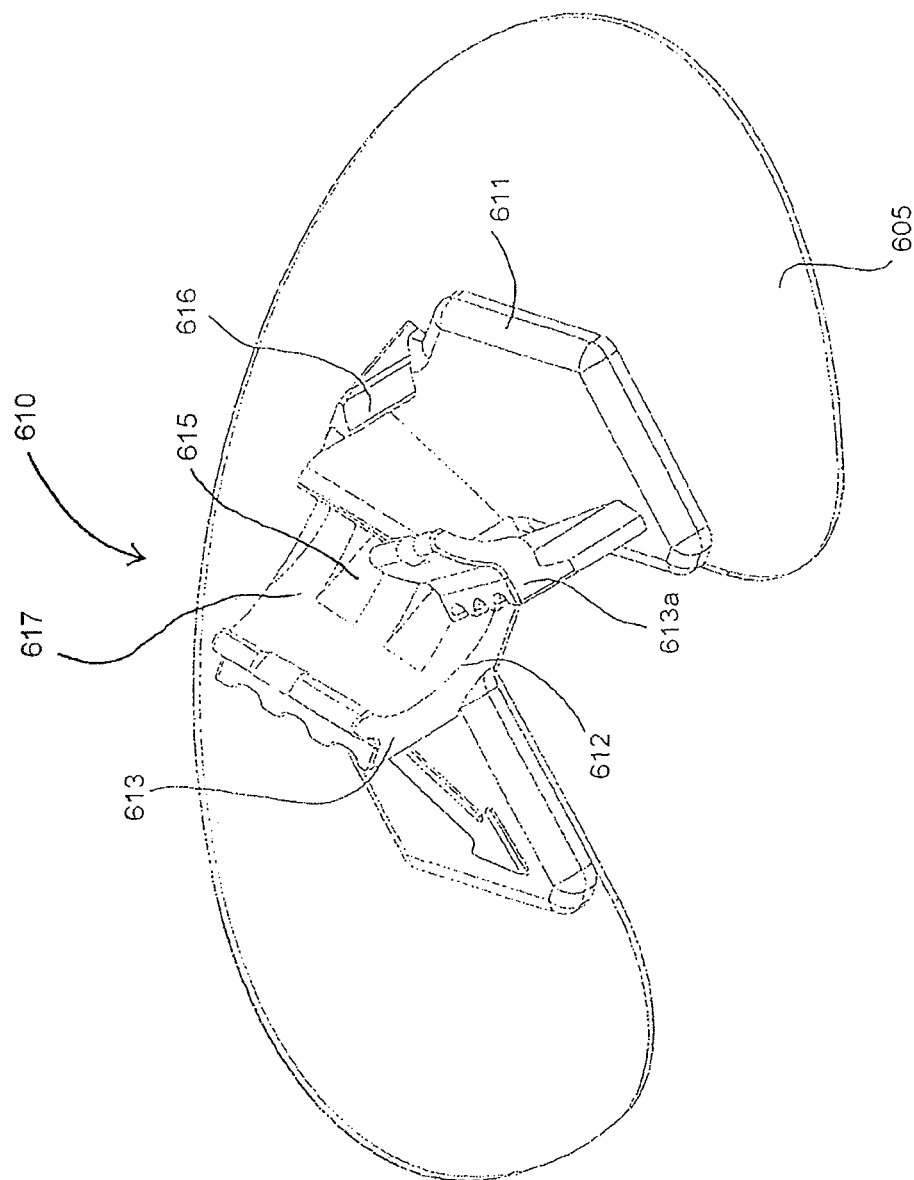


FIG. 64

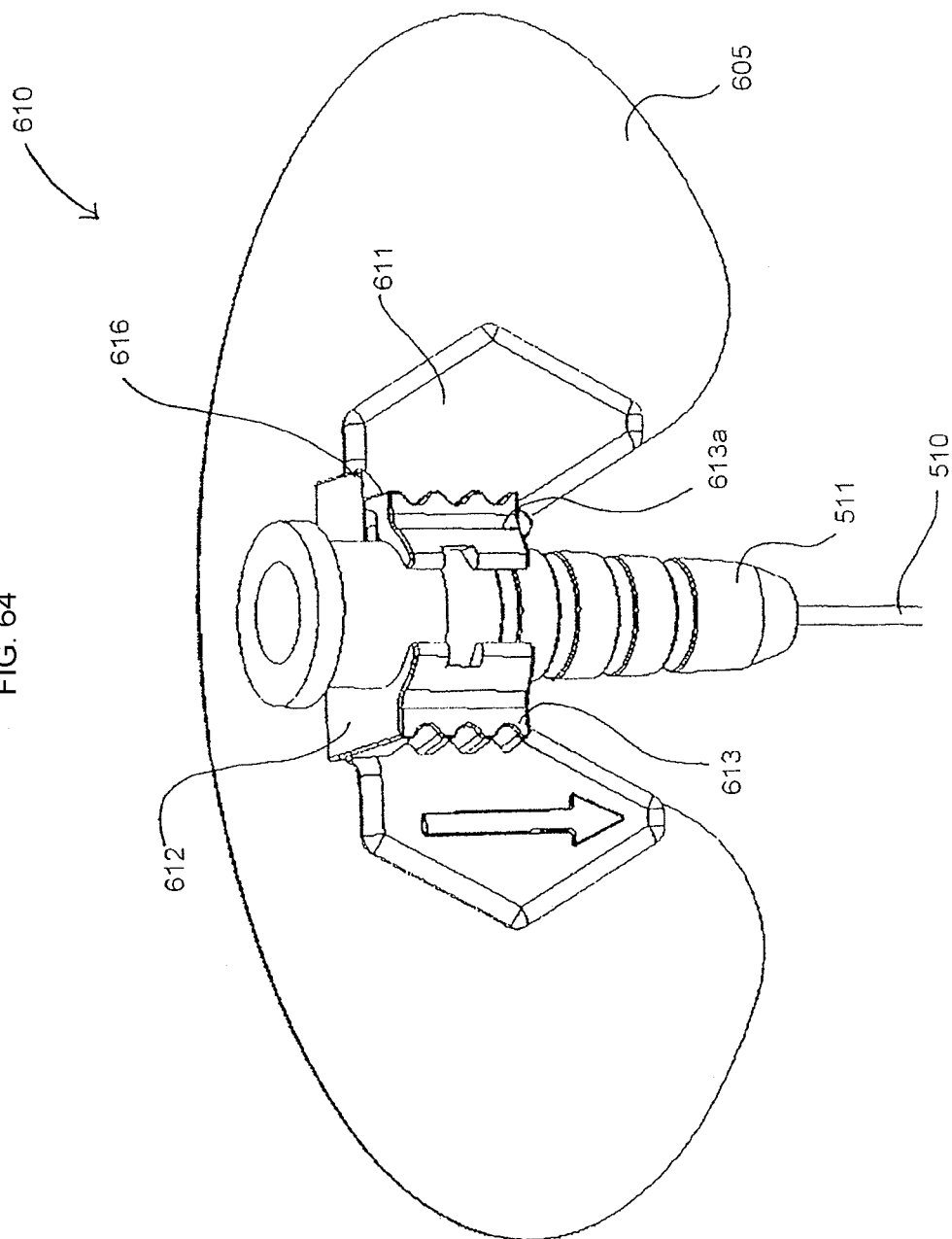


FIG. 65

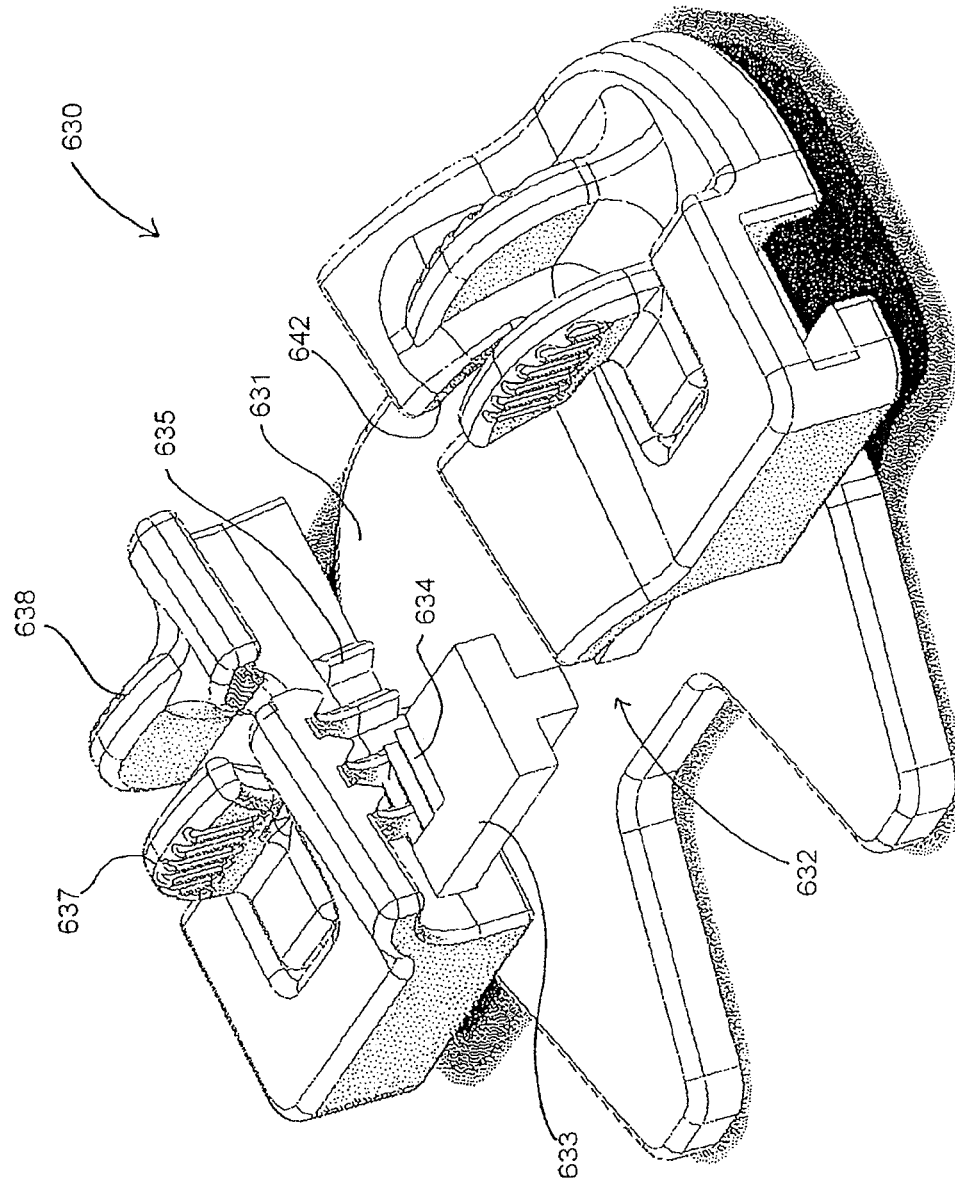


FIG. 66

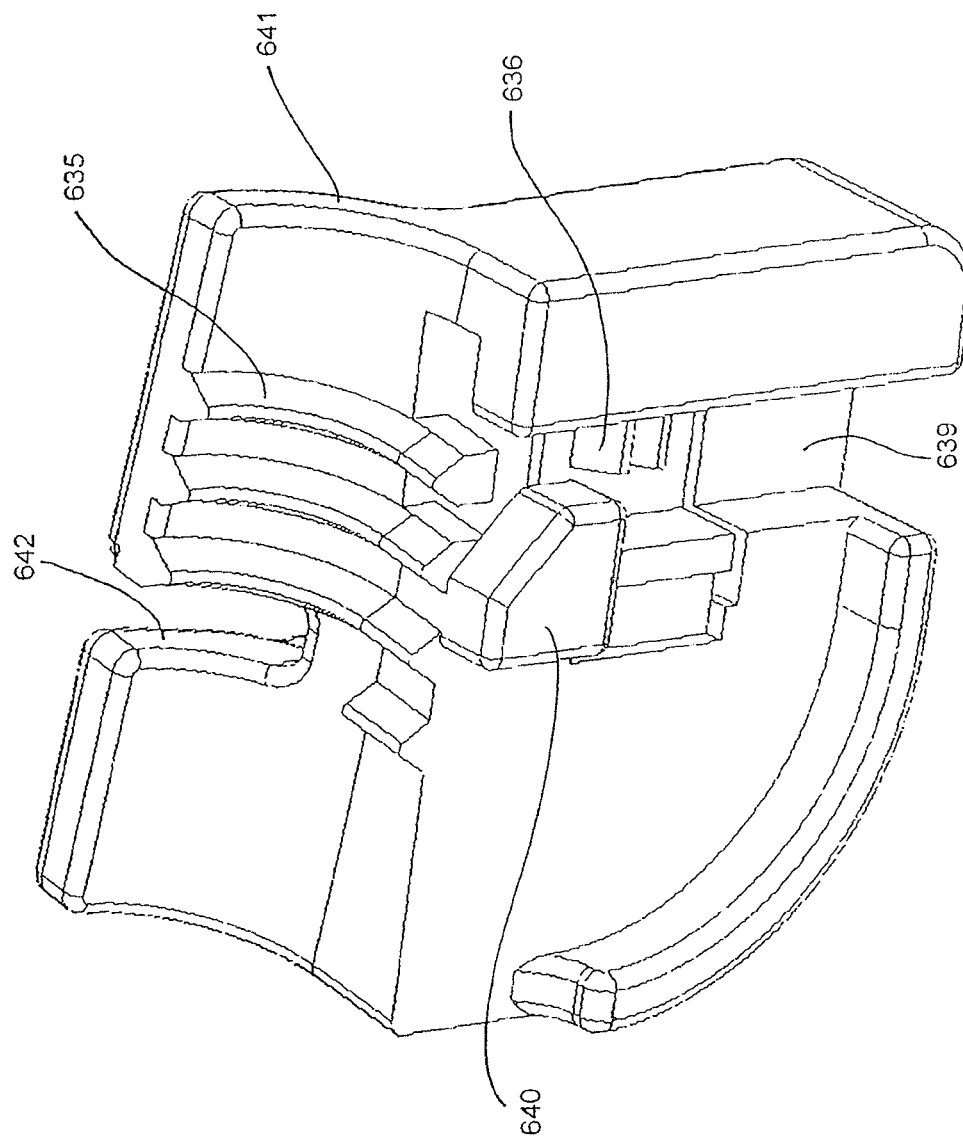


FIG. 67

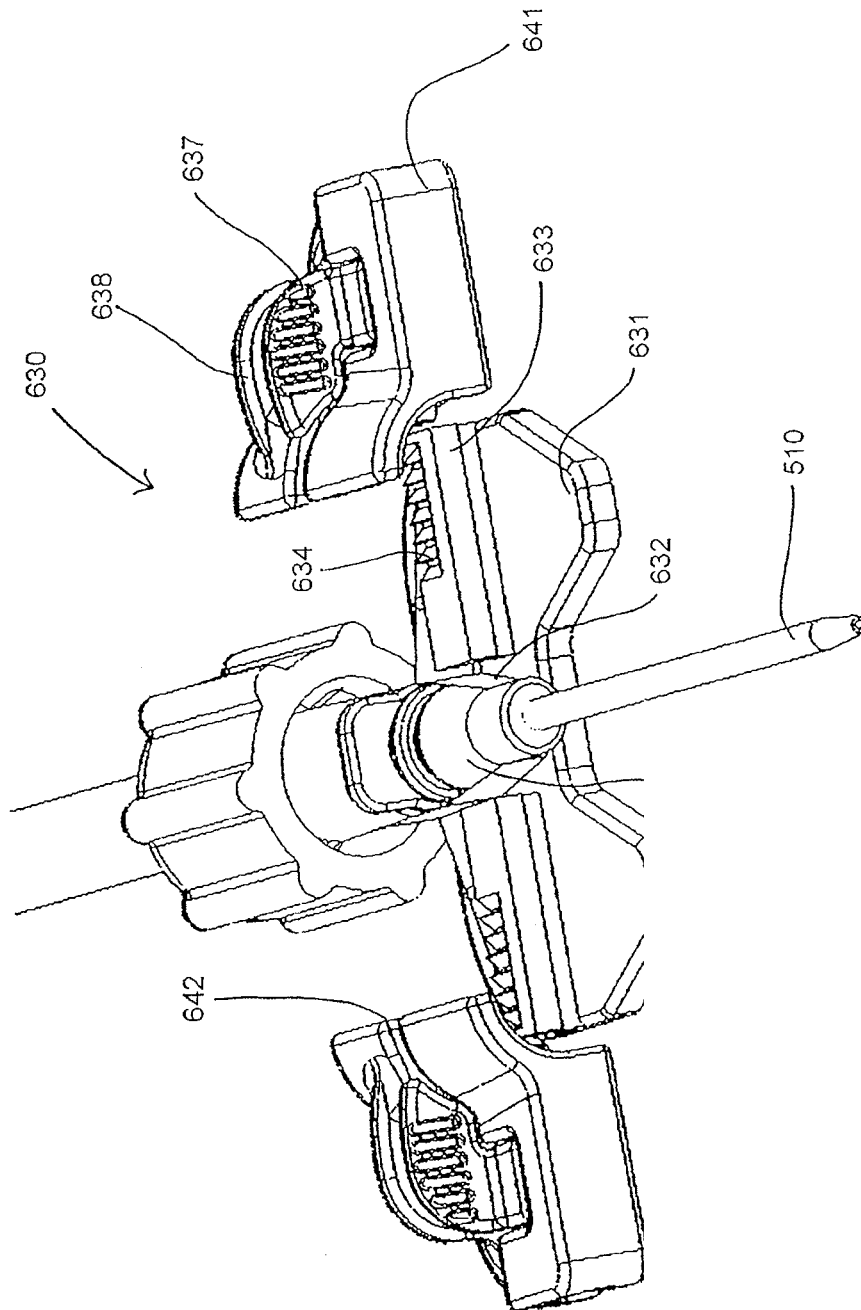
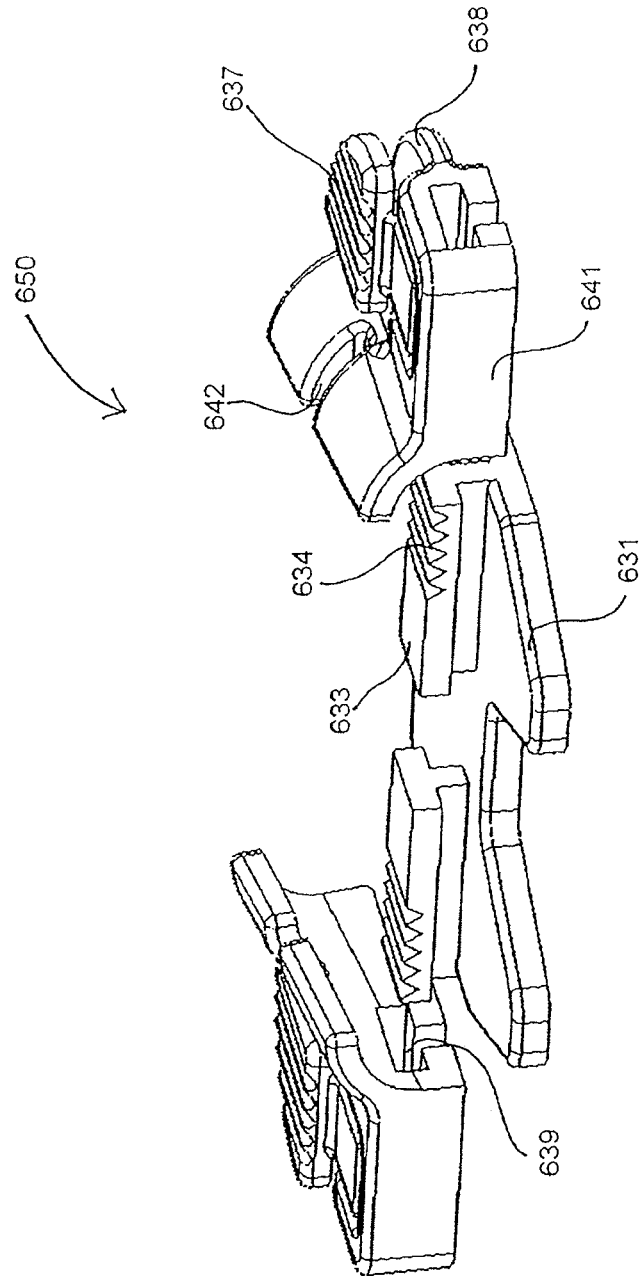


FIG. 68



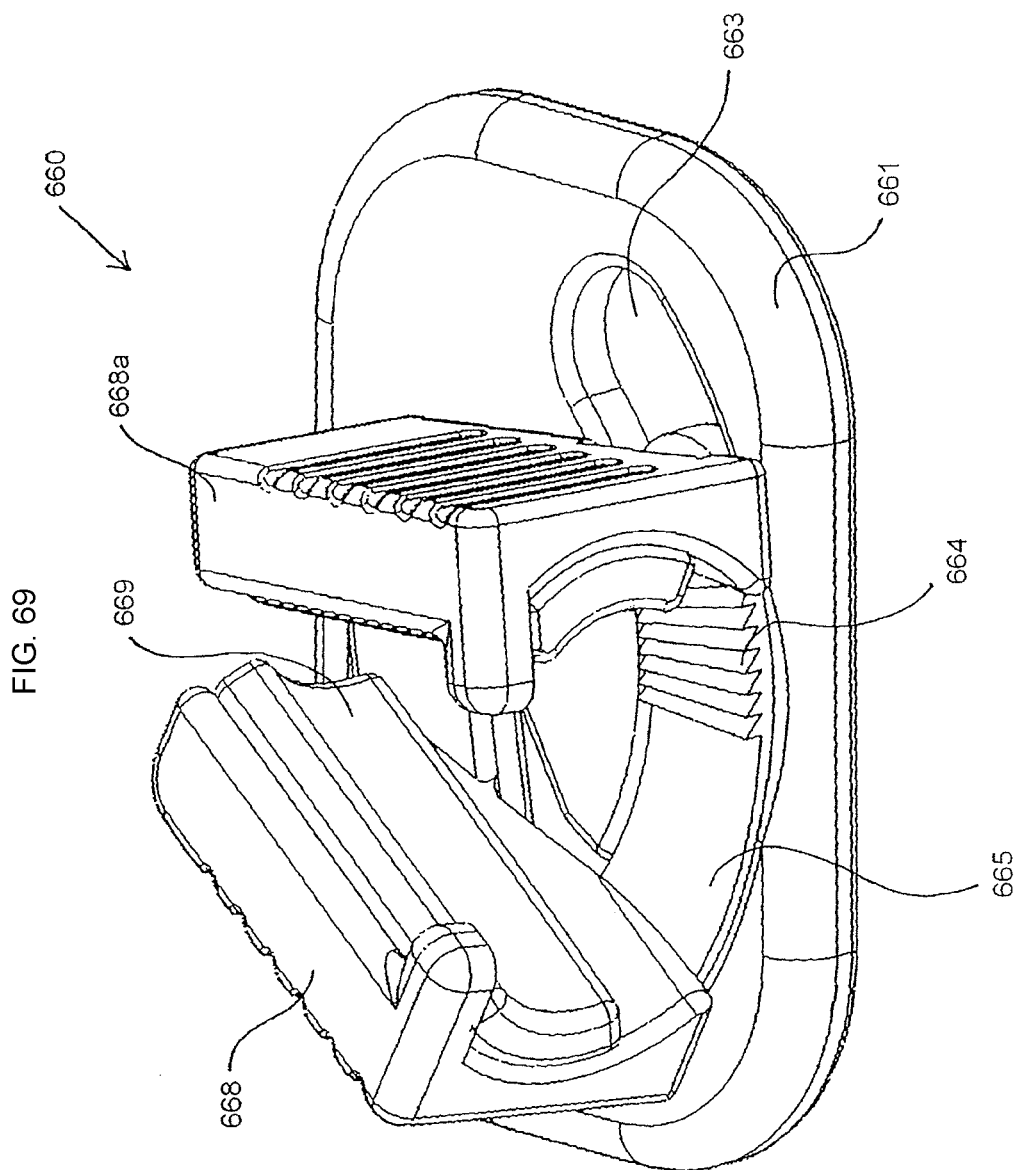


FIG. 70

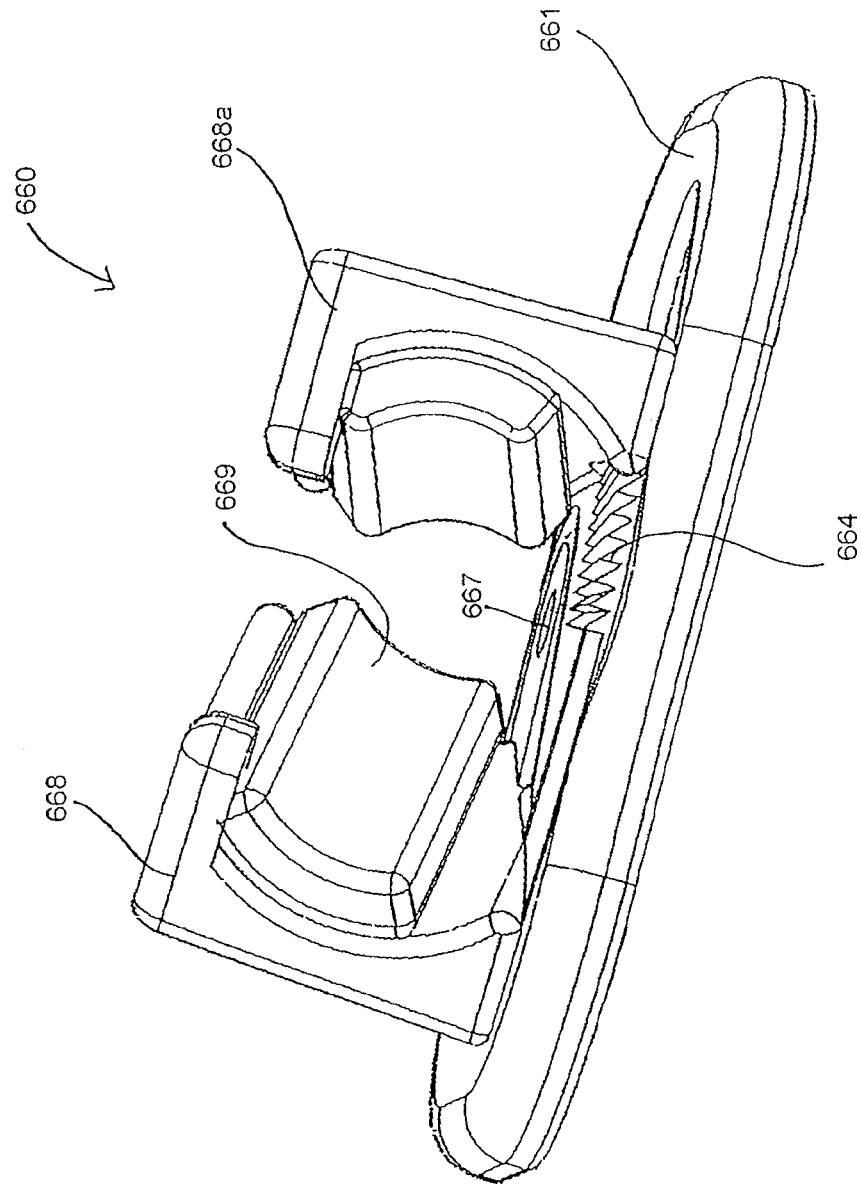


FIG. 71

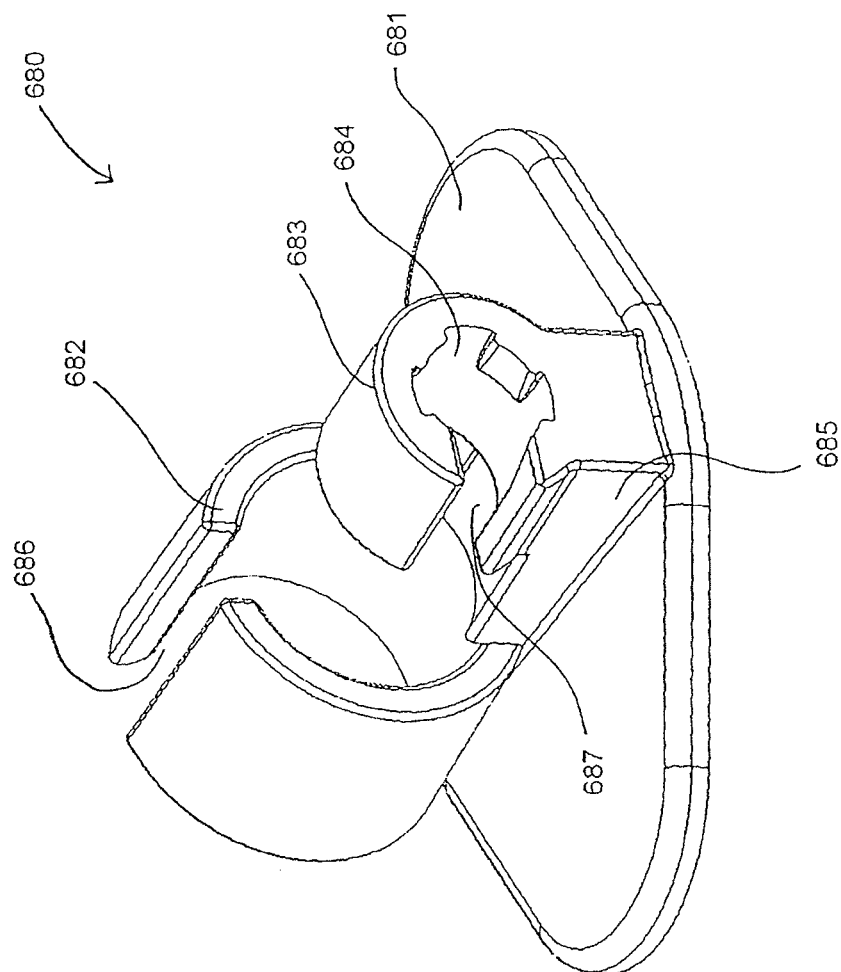
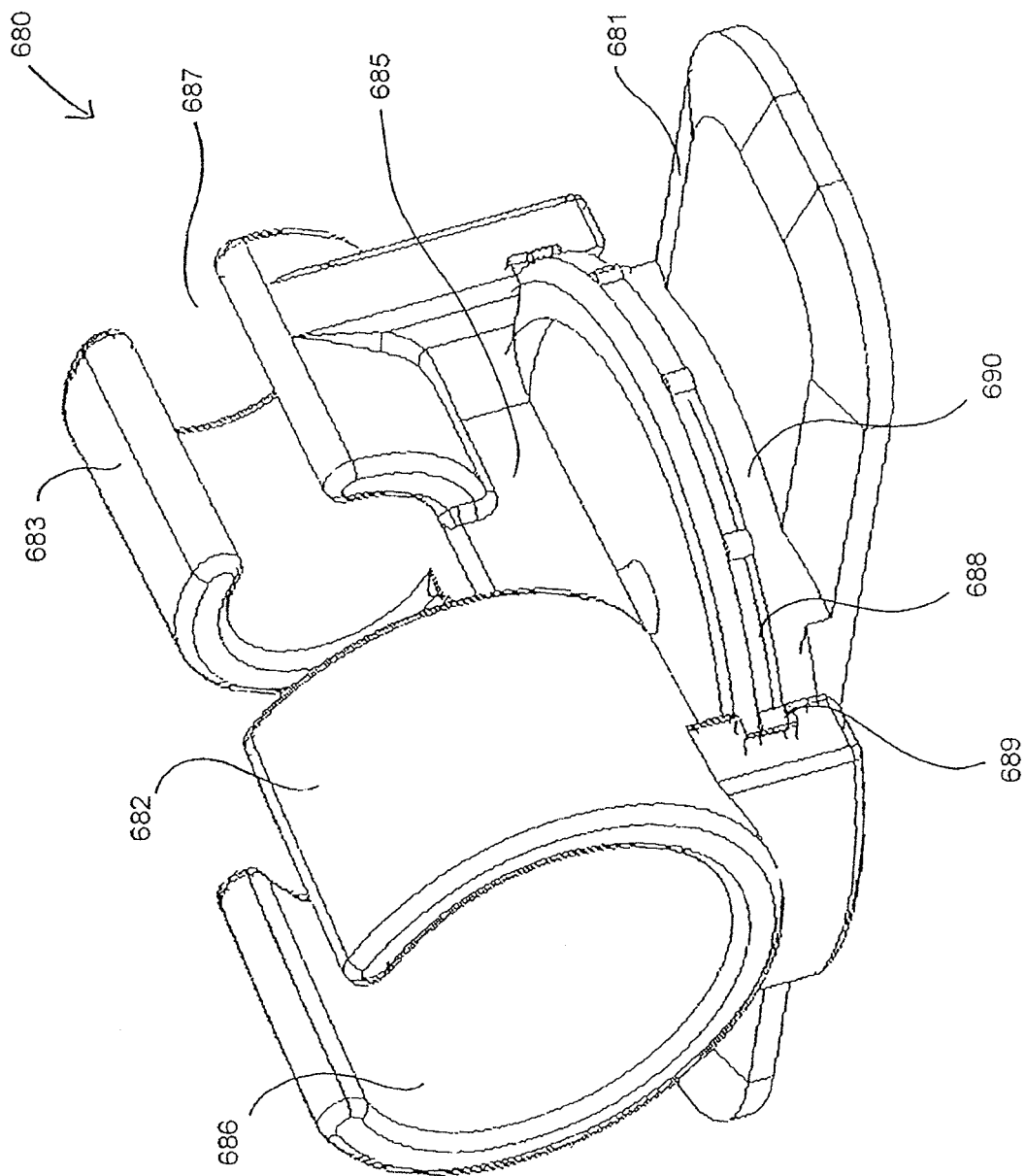


FIG. 72



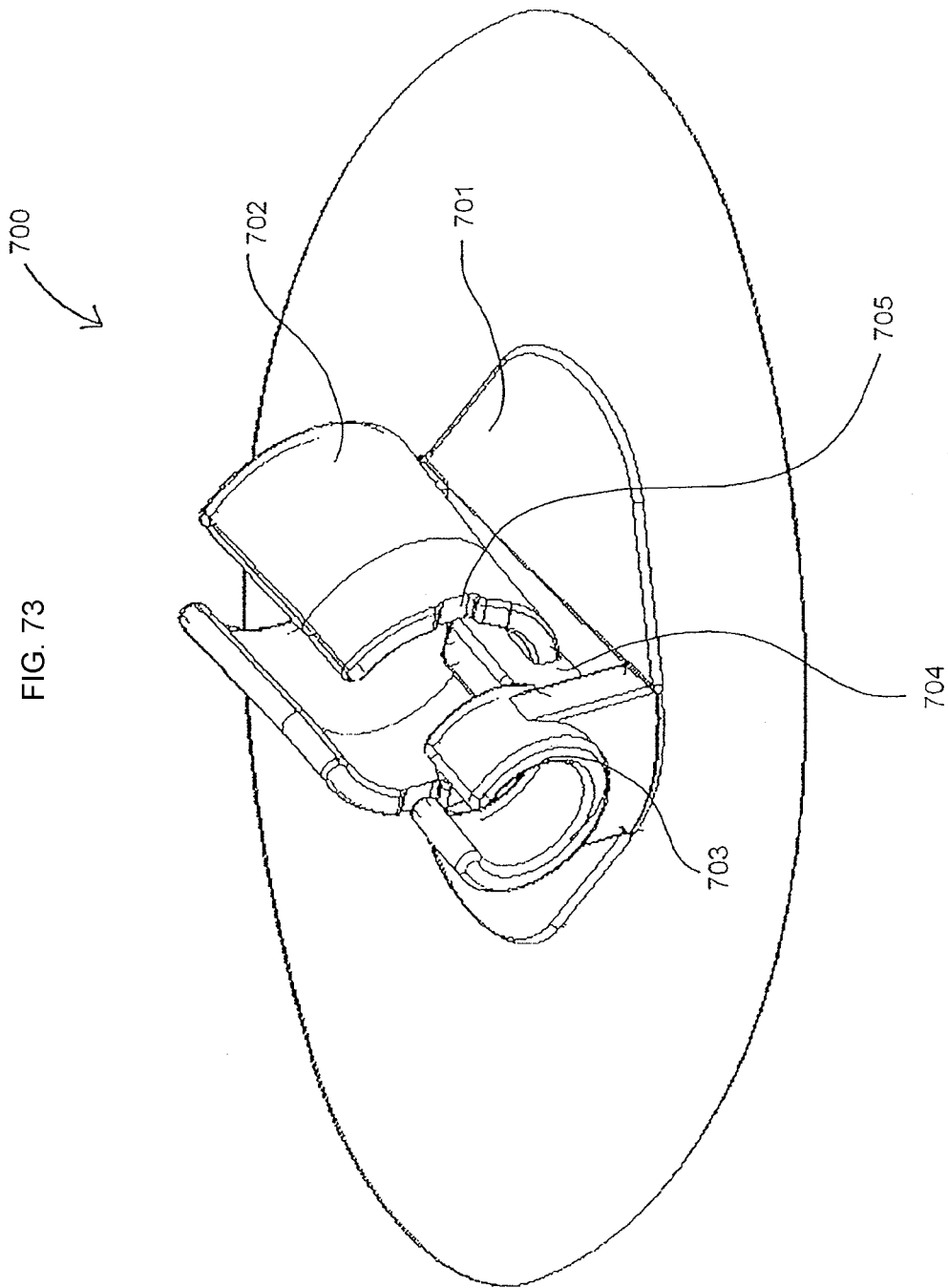
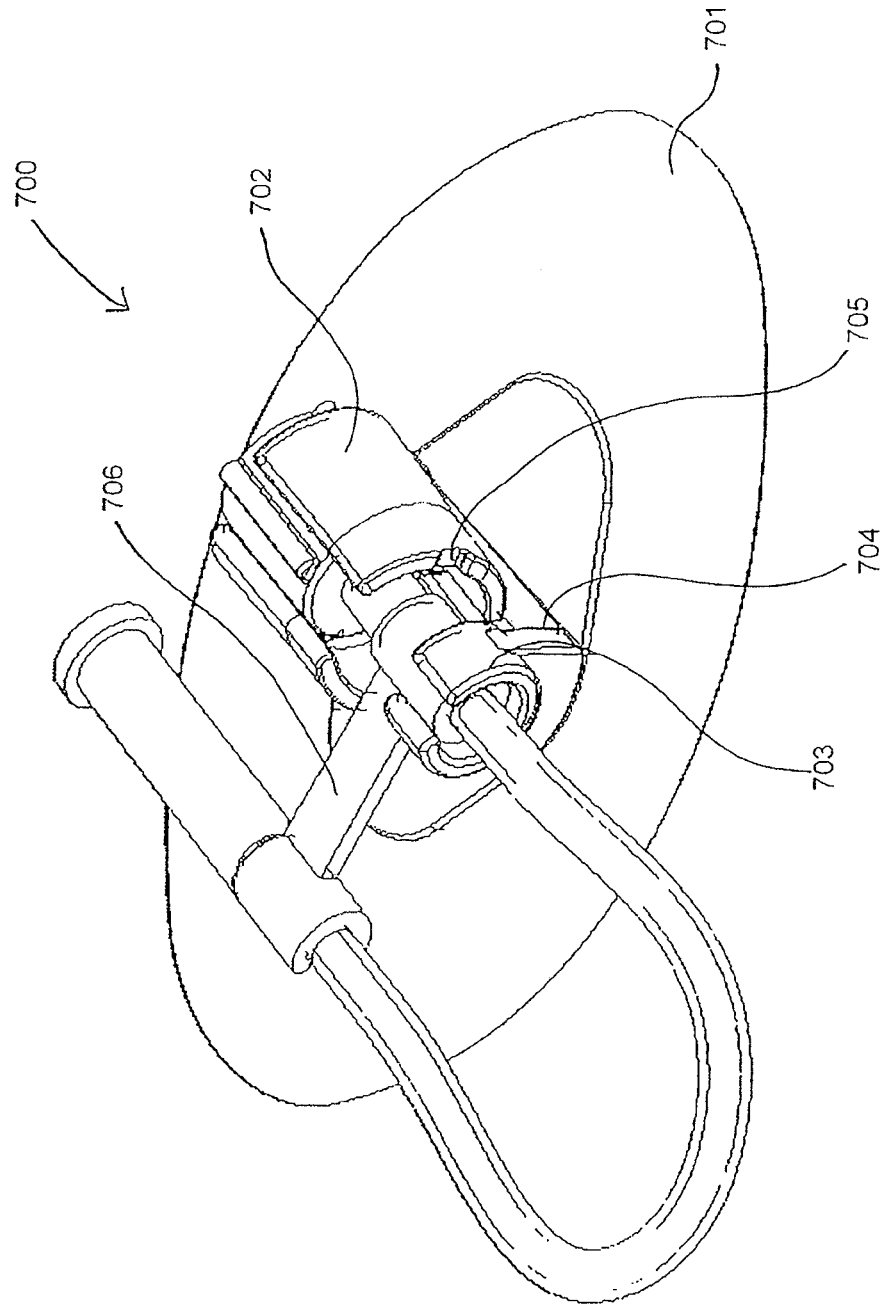


FIG. 74



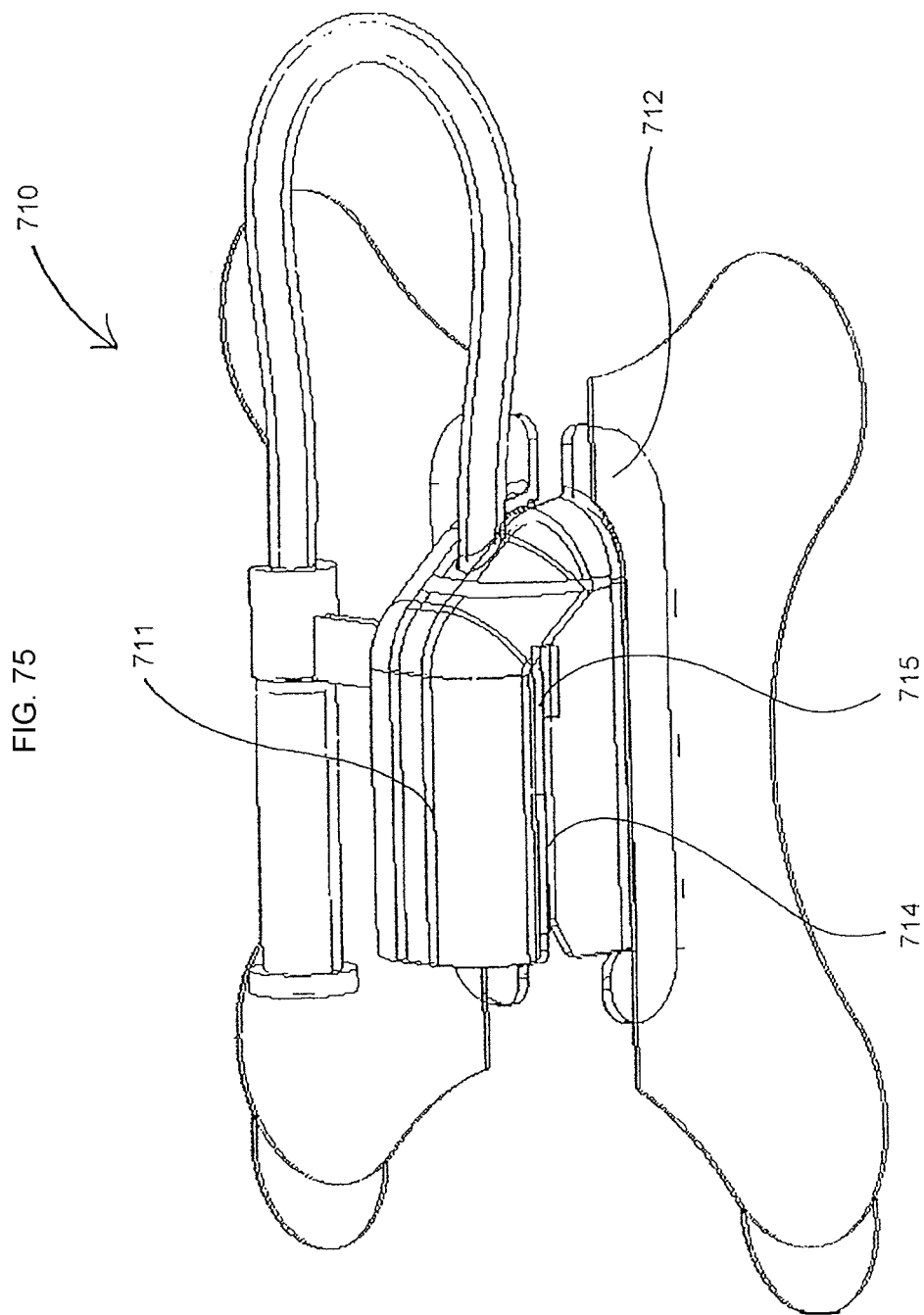
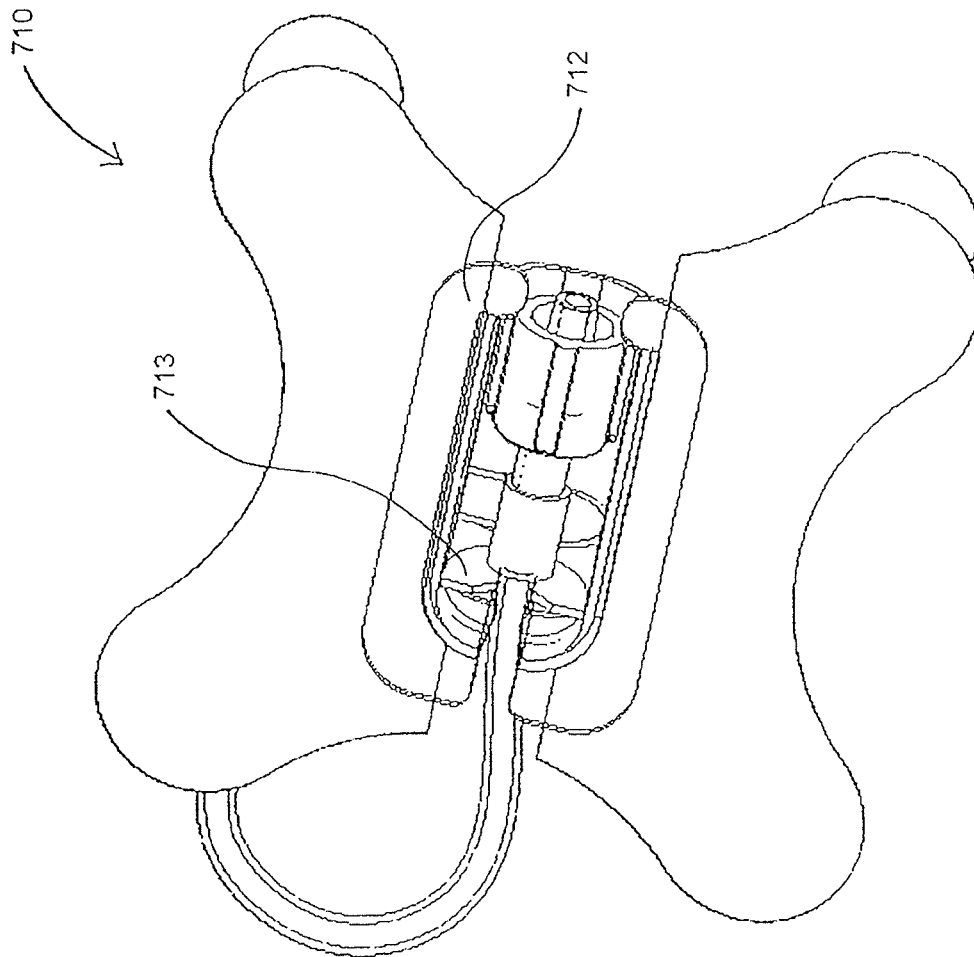


FIG. 76



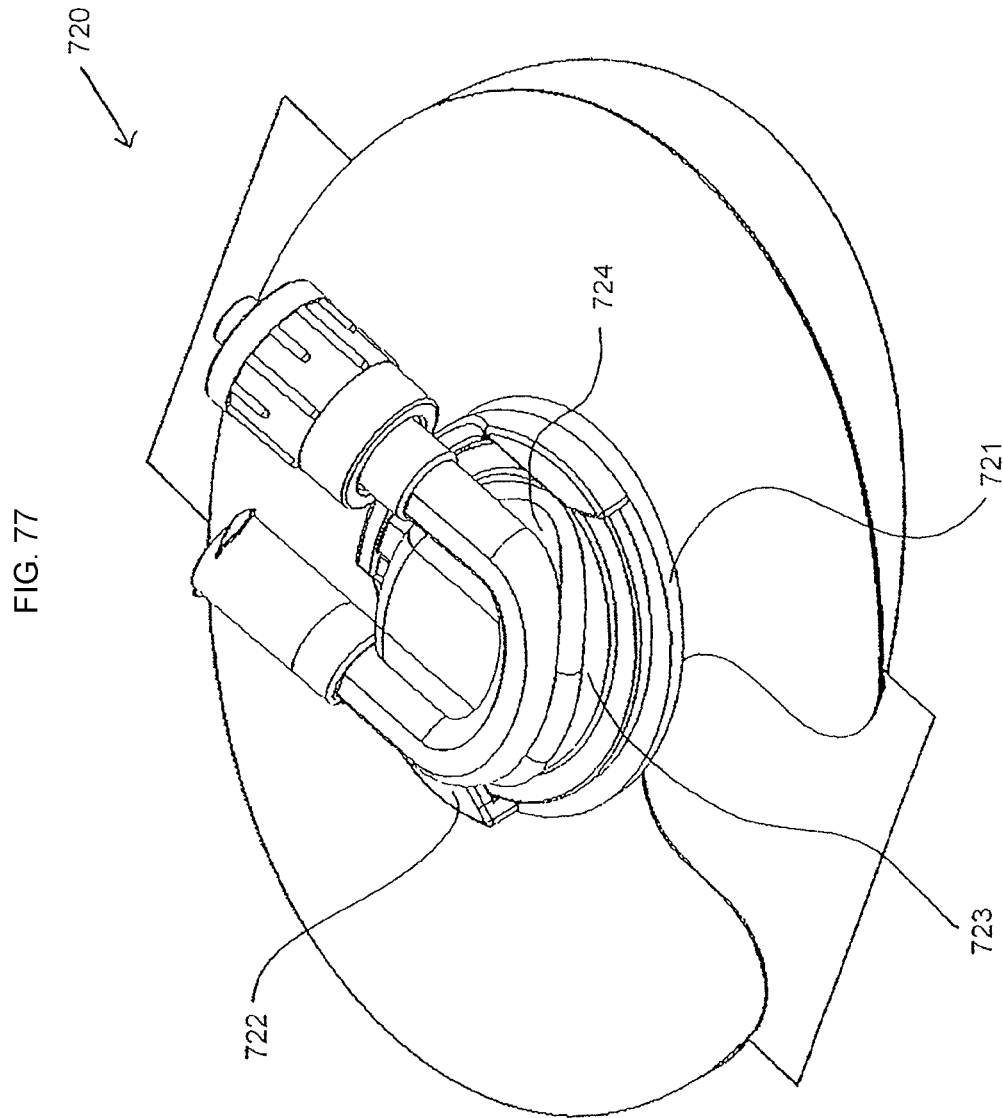
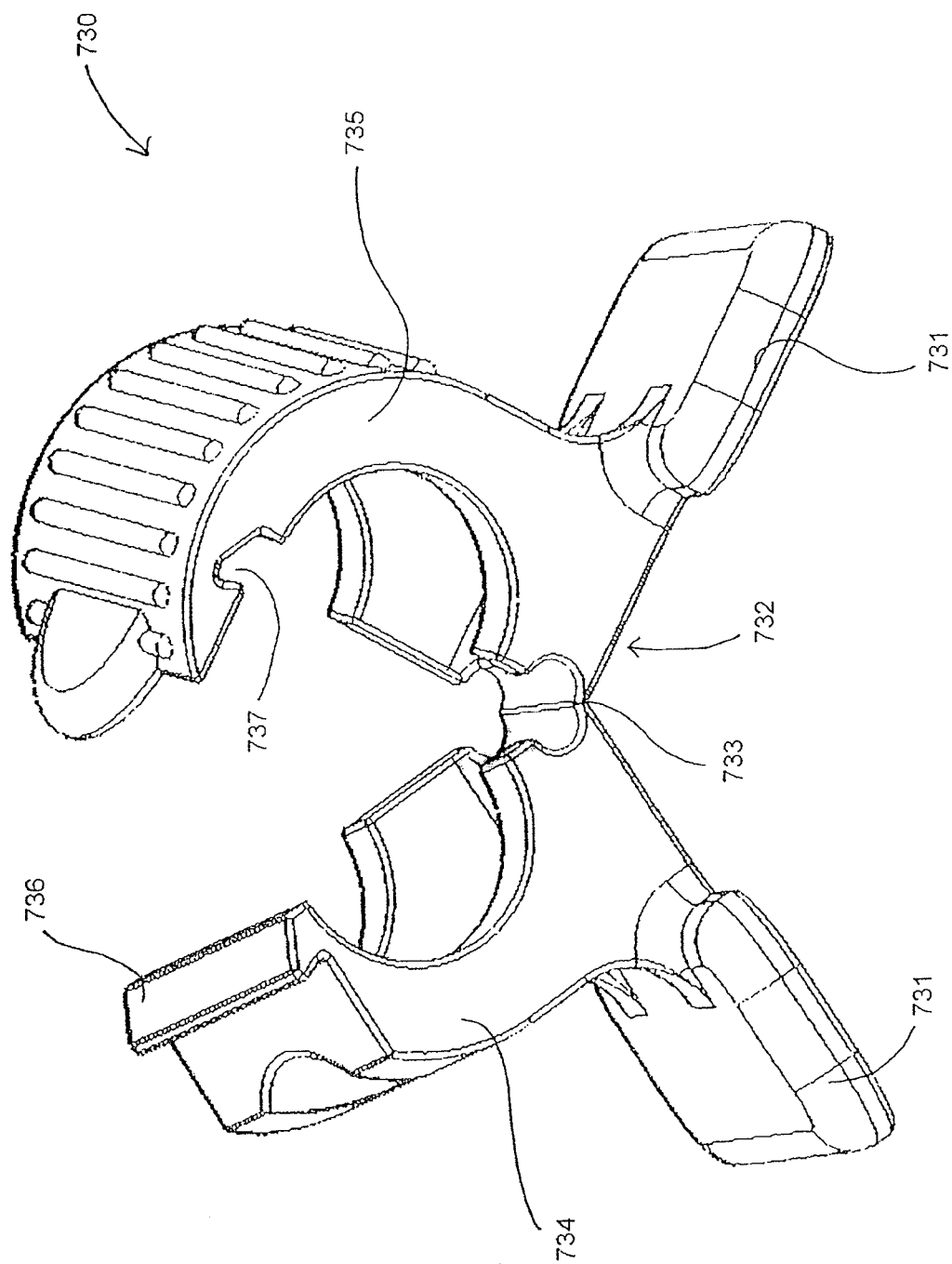


FIG. 78



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UNIVERSAL CATHETER SECUREMENT DEVICE

CROSS-REFERENCE TO RELATED APPLICATIONS

This application is a continuation of U.S. patent application Ser. No. 12/601,360, filed Nov. 23, 2009, now U.S. Pat. No. 8,105,290, which is a U.S. national stage application under 35 USC §371 of International Application No. PCT/US2008/065364, filed May 30, 2008, which claims the benefit of priority to U.S. Provisional Application No. 60/941,647, filed Jun. 1, 2007, each of which are hereby expressly incorporated by reference in their entireties.

BACKGROUND OF THE INVENTION

It is often necessary to introduce fluids and liquid medications directly into a blood vessel of a patient. Various types of catheters are often used in combination with connectors and syringes. A catheter is essentially a tube inserted through an incision in the skin into a blood vessel in the patient's body, generally without surgery. A simple intravenous (IV) line is usually acceptable for introduction of fluids and liquid medications into a blood vessel for short term general use. IV lines are typically inserted into a patient's arm by inserting a catheter that contains a needle which pierces the skin. The needle is then removed and discarded while the soft catheter stays in the blood vessel. The external portion of the catheter is usually taped in place or secured with a self-adhesive dressing to the patient's arm. This external portion often consists of flexible tubing and a locking hub. For longer term and more specialized needs, different types of catheters or other devices are used. Peripherally inserted central catheters (PICCs) are frequently used to provide medications or fluids to home care patients over longer periods of time. PICCs may also be used for frequent blood sampling.

IV lines commonly remain in patients for days at a time, while a PICC line and similar catheters may remain in place in a patient for several weeks or months. In both cases it is important that movement of the catheter be minimized. If the catheter is not secured in place, it may be inadvertently displaced from the intended location. Consequently, medication delivered through an IV or PICC line may then be released at an incorrect position within the blood vessel. Repeated back and forth catheter movement, or pistoning, can cause irritation of the blood vessel, disrupt proper introduction of medications to the patient, and increase the potential for bleeding or infection at the catheter incision site. If extensive movement occurs, the IV or PICC line could even come out of the patient, interrupting delivery of medication and requiring re-insertion, often with hospitalization.

In the past, catheters were simply taped into place on the patient's skin. However, taping is time consuming and labor intensive. Tape also collects bacteria and must be frequently removed and replaced. More importantly, taping is not necessarily effective in securing a catheter in place. Sutures have also been used to attach a catheter to a patient. With sutures, the catheter is stitched onto the skin. Sutures, however, can also be a source of infection, can cause pain and inflammation, and can make it more difficult to clean around the incision site. Sutures also require time and skill to place, and can cause scarring.

More recently, manufactured catheter anchors or securing devices have become widely used. These devices are designed to secure specific catheters in place. While various designs have been used, these devices generally have an adhesive-backed pad that bonds to the skin over a large area. The catheter is secured into or onto a catheter anchor designed for holding the catheter. However, engineering design challenges remain in providing reliable, secure and efficient designed for a specific type of catheter, multiple anchors may be needed to accommodate use of different types of catheters in hospitals, clinical settings, or other arenas. This adds to the cost and complexity of sourcing, inventory, storage, and selection of the anchoring devices. Accordingly, improved anchoring devices are needed.

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SUMMARY OF THE INVENTION

A universal device for securing a catheter on a patient includes a base which optionally has one or more locating elements for positioning or securing a catheter or catheter fitting of various shapes or sizes. The base optionally includes a recessed or flat receiving area defined by locating elements arranged in any configuration suitable to hold or receive a catheter or catheter fitting, e.g., in a tapering or V shaped formation. Additional locating elements may be positioned elsewhere on the base for receiving or holding a flange or wing or other part of a catheter fitting and preventing movement of the catheter fitting in various directions. The base optionally has an angled surface to maintain the desired angle of catheters or catheter fittings in a patient, e.g., in IV use. A cover is removably or permanently connected to the base and may optionally have one or more top openings for receiving tabs or extensions of a catheter fitting. The cover may optionally include one or more capture ridges for restraining a catheter or catheter fitting of various shapes or sizes on the base or on a retention plate. The cover may also include one or more tabs or contact bars for holding catheter fittings of various designs in place. One or more latching elements for securing the base to the cover in a closed position may optionally be included on either or both the cover and the base.

The base optionally has an opening and one or more restraining elements positioned on a surface of the base and extending over a portion of the opening. A retention plate having one or more locating elements for positioning or securing a catheter or catheter fitting of various shapes or sizes on the retention plate may be positioned in the opening of the base. Optionally, the retention plate may be movable in one or more directions. A support plate or similar device attached to the base holds the retention plate between the restraining elements and the support plate. The base or support plate may be attached to an adhesive pad for attachment to a patient.

Other features and advantages will appear hereinafter. The features described above and below can be used separately or together, or in various combinations of one or more of them.

BRIEF DESCRIPTION OF THE DRAWINGS

In the drawings, the same element number indicates the same element in each of the views.

FIG. 1 is an exploded perspective view of a securing device.

FIG. 2 is a top and front perspective view of the device shown in FIG. 1, with the cover lifted in an open position and base attached to an adhesive pad.

FIG. 3 is a plan view of the top surface of the base and locating elements of a securing device shown in FIGS. 1-2.

FIG. 4 is top and front perspective view of the base shown in FIGS. 1-3.

FIG. 5 is a back perspective view showing the bottom surface of the base shown in FIG. 4.

FIG. 6 is a plan view of the under side of the cover shown in FIGS. 1-2 and 5.

FIG. 7 is a top and back perspective view of the under side of the cover shown in FIGS. 1-2 and 5.

FIG. 8 is a cross section of a side perspective view of the securing device shown in FIGS. 1-2 and 5 in a closed position.

FIG. 9 is a top and front perspective view of the device shown in FIGS. 1-2 and 5 in a closed position.

FIG. 10 is a top and front perspective view of another embodiment of a securing device with the cover lifted in an open position.

FIG. 11 is a top perspective view of the base of the securing device shown in FIG. 10.

FIG. 12 is a plan view of the under side of the cover of the securing device shown in FIG. 10.

FIG. 13 is a top and back perspective view of the under side of the cover of the securing device shown in FIG. 10.

FIG. 14 is a plan view of the securing device shown in FIG. 10 in the closed position, holding a catheter fitting representative of various catheter fitting shapes and sizes.

FIG. 15 is a top and front perspective view of the securing device shown in FIG. 10 in the closed position, holding an exemplary catheter fitting.

FIG. 16 is a top perspective view of the cover of another embodiment of a securing device.

FIG. 17 is a perspective view of the under side of the cover shown in FIG. 16.

FIG. 18 is a side view of the cover shown in FIG. 16.

FIG. 19 is a top perspective view of a base for attachment to the cover of FIGS. 16-18.

FIG. 20 is a top and front perspective view of the cover and base shown in FIGS. 16-19 fastened together to form a securing device.

FIG. 21 is a top and front perspective view of a securing device attached to a pad.

FIGS. 22-29 are plan views of various catheter fittings positioned on the base and within the locating elements of the securing devices shown in FIGS. 1-2 and 10.

FIG. 30 is a top plan view of another base for use in a securing device.

FIG. 31 is a top and front perspective view of another embodiment of a securing device. The pad shown in FIG. 31 is used on each of the various securing devices described below. However, the pad as shown in FIG. 31 is omitted from the remaining drawings, to allow for better illustration of the other components.

FIG. 32 is an exploded perspective view of the device shown in FIG. 31.

FIG. 33 is a top perspective view of the device shown in FIG. 31, with the cover removed.

FIG. 34 is a plan view of the base shown in FIGS. 32 and 33.

FIG. 35 is a perspective view of the under side of the cover shown in FIGS. 31 and 32.

FIG. 36 is an exploded top and front perspective view of another securing device design useable with another type of catheter.

FIG. 37 is a front view of the device shown in FIG. 36.

FIG. 38 is a front and bottom perspective view of the device shown in FIGS. 36 and 37.

FIG. 39 is a top and side exploded perspective view of another securing device design useable with another type of catheter.

FIG. 40 is a top and front view of the device shown in FIG. 39.

FIG. 41 is a top perspective view of the base shown in FIGS. 39 and 40.

FIG. 42 is perspective view of the under side of the cover shown in FIGS. 39 and 40.

FIG. 43 is a top and side exploded perspective view of another securing device design useable with another type of catheter.

FIG. 44 is a bottom view of the base shown in FIG. 43.

FIG. 45 is perspective view of the under side of the cover used with the base shown in FIG. 43.

FIG. 46 is a perspective view of an alternative base, similar to the base shown in FIG. 43, and having a generally oval shape.

FIG. 47 is a side view of the base shown in FIG. 46.

FIG. 48 is an exploded perspective view of a securing device.

FIG. 49 is a plan view of the top surface of the base and retention plate of the securing device shown in FIG. 48.

FIG. 50 is a bottom perspective view of the underside of the base and retention plate shown in FIG. 49 without the support plate in place.

FIG. 51 is an exploded perspective view of a securing device.

FIG. 52 is a front perspective view of a base of a securing device.

FIG. 53 is a top perspective view of a cover of a securing device.

FIG. 54 is a top and front perspective view of another embodiment of a securing device with the cover lifted in an open position.

FIG. 55 is a top and front perspective view of the base shown in FIG. 54.

FIG. 56 is a perspective view of the underside of the cover of the securing device shown in FIG. 54.

FIG. 57 is a top and side perspective view of another embodiment of a securing device.

FIG. 58 is a perspective view of the underside of the cover of the securing device shown in FIG. 54.

FIG. 59 is a top and front perspective view of another embodiment of a securing device with the cover lifted in an open position with a catheter shown.

FIG. 60 is a cross sectional view of the securing device shown in FIG. 59 with the cover lifted in an open position.

FIG. 61 is a top and front perspective view of another embodiment of a securing device with the cover lifted in an open position.

FIG. 62 is a top and side perspective view of the securement device shown in FIG. 61.

FIG. 63 is a top and front perspective view of another embodiment of a securing device attached to an adhesive pad.

FIG. 64 is a top view of the securing device shown in FIG. 63.

FIG. 65 is a top and front perspective view of another embodiment of a securing device.

FIG. 66 is a view of the underside of a clamp of the device shown in FIG. 65.

FIG. 67 is a top and front perspective view of the securing device shown in FIG. 65 with a catheter in place.

FIG. 68 is a top and front perspective view of another embodiment of a securing device.

FIG. 69 is a perspective view of another embodiment of a securing device.

FIG. 70 is a perspective view of the base shown in FIG. 69.

FIG. 71 is the top and front perspective view of another embodiment of a securing device.

FIG. 72 is a rotatable version of a securing device.

FIG. 73 is the top and front perspective view of another embodiment of a securing device attached to an adhesive pad.

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FIG. 74 is the top and front perspective view of the securing device shown in FIG. 73 with a J-loop shown.

FIG. 75 is the top and side perspective view of another embodiment of a securing device with a J-loop shown.

FIG. 76 is a bottom view of the securing device shown in FIG. 75.

FIG. 77 is a top and front perspective view of a securing device with a slidable receiving plate on the base.

FIG. 78 is a perspective view of another embodiment of a securing device.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENT

Various embodiments of the invention will now be described. The following description provides specific details for a thorough understanding and enabling description of these embodiments. One skilled in the art will understand, however, that the invention may be practiced without many of these details. Additionally, some well-known structures or functions may not be shown or described in detail so as to avoid unnecessarily obscuring the relevant description of the various embodiments.

The terminology used in the description presented below is intended to be interpreted in its broadest reasonable manner, even though it is being used in conjunction with a detailed description of certain specific embodiments of the invention. Certain terms may even be emphasized below; however, any terminology intended to be interpreted in any restricted manner will be overtly and specifically defined as such in this detailed description section.

Where the context permits, singular or plural terms may also include the plural or singular term, respectively. Moreover, unless the word "or" is expressly limited to mean only a single item exclusive from the other items in a list of two or more items, then the use of "or" in such a list is to be interpreted as including (a) any single item in the list, (b) all of the items in the list, or (c) any combination of items in the list.

A universal securing device for holding catheters or catheter fittings of various designs, shapes, or sizes may include a base and a cover. The cover may be connected to the base by a hinge which allows the cover to be lifted open or pushed down into a closed position, to secure a catheter fitting or similar device. The base and/or cover have locating elements configured and arranged to fit around catheters and catheter fittings of various shapes and sizes. The catheter fitting is placed into or onto the base from above. The locating elements prevent substantial movement of a catheter and/or catheter fitting in multiple dimensions.

A catheter fitting to be held by and of the devices described herein includes any type of catheter fitting, attachment, accessory, connector, etc., whether integral with the catheter or as a separate piece from the catheter. A catheter may also refer to a catheter alone or in combination with any type of catheter fitting.

Latching elements, which may be located on squeezing arms, hold the cover onto the base. Capture elements may be located on the under side of the cover to compress a catheter fitting, securely holding it in place against the base, in the closed position. The catheter may be held securely in place on a patient once the securing device is attached to the patient. The catheter can be removed from the base by disengaging the latching elements, for example, here by squeezing the squeezing arms toward each other. Thus, a catheter and catheter fitting of various shapes and sizes can be securely held by a single securing device and can be quickly and easily attached to or removed from the patient.

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The devices described herein may be used with, e.g., PICC lines, IV catheters, Foley catheters, heart catheters, J-loops, epidural lines or catheters, arterial lines or catheters, and various others. In addition to a catheter, the securing devices herein may be used to secure other tubes, cables, wires, and various other medical devices as well.

Turning now to the drawings, as shown in FIGS. 1-9, a securing device 20 has a base 26. As shown in FIG. 2, the base 26 may be contoured and may have one or more locating elements 40 which are shaped and dimensioned to be positioned around and hold catheters and catheter fittings of various shapes and sizes, such as catheter fitting 32 and catheter 30. In FIGS. 2-5 and 8-9, the locating elements 40 include rectangular shaped walls, however, locating elements may be round, square, hexagonal, etc. and they may take on various forms in addition to walls such as pegs, columns, etc. The base may vary in size and typically is about 2-3 inches long and about 1-2 inches wide.

Referring to FIGS. 3-4, the locating elements 40 extend up from the base 26. In this particular embodiment, the locating elements include at least one front wall 41 and a pair of back walls 46. The front and back walls are spaced apart in a front to back direction as indicated by arrow 49, which runs along a longitudinal axis identified by the imaginary line marked Y shown in FIG. 3. A front wall 41 shown in FIGS. 3-4 is made up of at least one curved end wall 42, at least one angled front wall 43, at least one elbow 44. A semicircular trough 45 may be positioned slightly forward of the angled front wall 43 as indicated by arrow 49 and may be connected to the elbow 44. A raised post may extend up from at least one elbow 44. The back walls 46 are preferably angled and are each connected to a post 47. The first and second posts 47 connected to either back wall 46, can be the same size or they may differ in size. In general, the locating elements 40 may be substantially symmetrical side-to-side about the longitudinal axis or centerline Y. The locating elements 40 are arranged and positioned to allow PICCs and other catheters of various shapes and sizes to be placed onto the base 26 and held within the securing device 20. The locating elements 40 are arranged in a manner to help position catheters and catheter fittings of various shapes and sizes and prevent substantial movement of a catheter and catheter fitting in various dimensions relative to the base, e.g., side-to-side and back-to-front, axial movement, as well as rotational movement.

Referring to FIGS. 3-4, in one embodiment the locating elements 40 are arranged such that a front wall 41 is separated from the back wall 46 by a dimension AA which extends straight back, parallel to the longitudinal Y axis, from the rear most tip of curved end wall 42 of front wall 41 to the back wall 46. The front wall 41 may also be separated from the back wall 46 by a dimension BB which extends from the rear most tip of curved end wall 42 of front wall 41, straight back and perpendicular to the back wall 46. Also, the inner edge of the first or left post 47 may be separated from the inner edge of the second or right post 47 by a dimension CC running generally parallel to a lateral axis X. Also, the first or left elbow 44 may be separated from the second or right elbow 44 by a dimension DO running parallel to dimension CC.

In one embodiment, dimension AA may be less than dimension BB. Also, dimension CC may be greater than dimension DD. In another embodiment dimension AA may measure about 0.34 to 0.38 inches, preferably 0.35 to 0.37 inches, or more preferably 0.36 inches in length. Dimension BB may measure about 0.37 to 0.41 inches, preferably 0.38 to 0.40 inches, or more preferably 0.39 inches in length. Also, dimension CC may measure about 0.35 to 0.39 inches, preferably 0.36 to 0.38 inches, or more preferably 0.37 inches in

length and dimension DD may be about 0.28 to 0.32 inches, preferably 0.29 to 0.31 inches, or more preferably 0.30 inches in length. In another embodiment, dimension CC may be about 130 to 170% of dimension DD or more preferably about 140 to 160% of dimension DD.

Referring to FIGS. 3-4, the base may also include one or more spikes 48 extending up from the base. In one embodiment, a line of posts or spikes 48, are located on a line between front wall 41 and back wall 46, on both sides of axis Y. The line of posts or spikes 48 may be generally parallel to each other and to the longitudinal axis Y or at an angle of, e.g., 1-45° to the longitudinal axis Y. The spikes 48 may extend up from the surface of the base or from capture elements running generally parallel to each other and to the longitudinal axis Y or at an angle of, e.g., 1-45° to the longitudinal axis Y, on both sides of axis Y between a front wall 41 and a back wall 46.

Referring to FIG. 1, the base 26 may have two squeezing arms 50 or optionally the base 26 may have one arm 50 that is resilient and flexible and a second arm 50 which is generally fixed and rigid. The base 26 may also have a hinge block 62 located on the base 26 at an opposite end from the squeezing arms 50. The squeezing arms 50 are flexible and have latching elements 52 and sidewalls 57. An angled surface 56 may be provided at the end 54 of each of the latching elements 52 facing the inner surface of a squeezing arm wall 57, with grip ribs 59 on the outside of each squeezing arm wall 57. As shown in FIG. 3-4, a through hole 66 may be provided, if desired, in the base 26, behind the hinge block 62. An arrow symbol 49 may be printed, molded or otherwise provided on the base 26 and/or the cover 28, running along a longitudinal Y axis, as shown in FIG. 3. The arrow indicates in which direction the catheter should be installed into the universal securing device 20.

As shown in FIG. 1, the cover 28 has latch holes 70, and hinge pinholes 73 located at opposite ends of the cover 28. Ridges 71, each having an angled surface 72, may optionally be provided below the latch holes 70, as shown, e.g., in the embodiment of FIG. 10. As shown in FIG. 2, the cover 28 is connected to the base 26 by a hinge 60. FIG. 1 shows that the hinge may be provided by pressing a hinge pin 75 through hinge pinholes 73 and through an aligned hinge pin slot 64 which runs through the hinge block 62. The hinge pin 75 may have a round diameter and may include one or more, preferably four, raised crush ribs 77 which serve to hold the hinge pin 75 in place by friction after being press fit through the hinge pinholes 73 and hinge pin slot 64. The hinge may also take various other forms, for example, a hinge may be formed by tongue and groove elements. A hinge may also be formed by a snap fitting mechanism between a latch or snap hinge and snap hinge base. Various types of hinges or pivot joints may be used. Most designs will have a hinge at one side of the device and a latching element at the other side, with the cover pivoting open and closed. However, an alternative design may have a separate snap on cover having a latch or lock element at either end of the cover.

As best shown in FIGS. 6-7, the cover 28 includes a first opening 83 in a front wall 84 and a second opening 85 in a back wall 86. The cover 28 may have one or more bars 80 which run in a direction DL on the underside of the cover 28, generally parallel to the lateral X axis. The center area of the bars 80 may be recessed compared to the ends of the bars 80 in order to accommodate the height of various catheter fittings. The bars 80 may be connected by one or more capture elements 82 on the underside of the cover 28. The capture elements 82 may be generally parallel to each other and to the longitudinal Y axis, or at an angle of, e.g., 1-45° to the longitudinal axis. The ends of the capture element 82 may rest at

least partially on the surface of the bars 80. One or more posts or spikes 88 may extend from the capture elements 82. In the design shown in FIG. 7, three spikes 88 are spaced evenly apart and extend up from a center elevated segment 86 on the surface of the capture element 82. Optionally, the capture elements 82 may run along the underside of a cover where the cover has no bars.

Turning momentarily to FIG. 2, the capture element 82 is adapted to contact and compress catheter fittings of various shapes and sizes such as catheter fitting 32, e.g., by compressing the wings and/or body of a catheter fitting 32 once the catheter fitting 32 is placed onto the base 26 within the locating elements 40 and the cover 28 is attached to the base 26 in a closed position. Capture elements 82 may be solid or spring molded as leaf springs or foam springs. Capture elements 82 may also be an elastomer. The surface of a capture element 82 may optionally be provided with cones or serrated teeth to assist with compression and gripping of a catheter fitting 32. A single capture element 82 or multiple capture elements 82 may be used. In the specific design shown in FIG. 2, two capture elements are provided.

Referring again to FIGS. 2 and 4, in use, after the catheter has been inserted into the patient, the skin at the securement site is preferably cleaned. The catheter fitting 32 is then placed into or onto the base 26, within the locating elements 40. The cover 28, which is attached to the base 26 via the hinge 60, can be closed down, by pivoting about the ends of the hinge pin 75 positioned inside the hinge block 62, over and onto the catheter fitting 32. The curved end wall 42, elbow 44 and semicircular trough 45, all serve to center and align the cover 28 as the cover 28 is moved down and over the front wall, onto the base 26, and into the closed position. The outside surface of the curved end wall 42, elbow 44 and semicircular trough 45 may abut against the inner surface of the front wall 84 of the cover 28 as the cover 28 moves down and into the closed position. Also, a raised post which may be located atop one or more elbows 44 may also help align the cover 28 as it closes onto the base 26, and it too may optionally abut against the inner surface of the front wall 84 of the cover 28 as the cover 28 moves down and into the closed position. Also, one or both of the posts 47 connected to a back wall 46 may serve to center and align the cover 28 as the cover 28 is moved down and over a back wall 46 and the first and second posts 47. The first and second posts 47 and back walls 46 may abut against the inner surface of the cover 28 as the cover 28 moves down and into the closed position. These alignment features help

In a closed position (as shown in FIG. 9), the top end 78 of the cover 28 attaches to the base 26 within the squeezing arm walls 57. The latch holes 70 in the front wall 84 and back wall 86 of the cover 28 engage the latching elements 52 on the squeezing arms 50. This facilitates the secure attachment of the cover 28 to the base 26, placing the securing device 20 in a closed position. The cover 28 rests on the flat and contoured outer areas of the base 26, around the front wall 41 and back walls 46 (not shown because enclosed by cover), and on the flat area of the squeezing arms 50.

In a closed position, the spikes 88 on one or more capture elements 82 may compress down on the wings and/or body of the catheter fitting 32. The wings of the catheter fitting 32, which are generally somewhat flexible or compliant, are thereby pinched or held between the spikes 88 of capture element 82 and the spikes 48 extending up from the surface of the base 26. The spikes 88 and the spikes 48 are located to grip and compress the wings and/or body of the catheter fitting. As shown in FIG. 8, the spikes 88 and spikes 48 are preferably about 0.04 inches in height and some vertical space may exist

between the tips of the spikes **88** and the spikes **48** when the cover **28** is in the closed position. The spikes **88** may also be slightly offset by 0.02-0.12 inches to the inside of the spikes **48**, i.e., toward the arrow **49**. The spikes **88** may also be similarly offset to the front of the spikes **48**, as indicated by arrow **49**. This applies a pinching or bending effect on the wings of the catheter, in addition to compression. By having the top and bottom spikes offset from each other, the device **20** can better secure catheters having wings of varying thickness.

The capture elements **82** thereby secure a catheter fitting **32** within securing device **20** by preventing substantial movement of catheter fitting **32** in an axial, side-to-side, back-to-front, up and down and rotational direction. The capture element **82** may be resilient and flexible, capable of holding and gripping catheter fittings of various thicknesses. The capture element **82** may also be solid. The cover **28** may be used in conjunction with a base **26**, having locating elements **40** and spikes **48**, for securing a catheter fitting.

In another embodiment, the cover **28** may be used in conjunction with a base **26** for compressing and holding a catheter body on a patient. The base may or may not have locating elements. In use, this embodiment would function by placing a catheter on a base **26** and compressing or pinching the catheter body between an underside surface of a cover **28**, e.g., against capture elements **82** or any part of the underside of the cover, and a top surface of the base with sufficient force to hold or restrain the catheter in place without substantial movement in various dimensions relative to the base and cover, e.g., axial, side-to-side, back-to-front, up and down and rotational. This arrangement, for compressing a catheter body of various shapes and sizes between a cover and base could be performed with any of the additional embodiments described below as well.

Referring again to FIGS. **2** and **4**, as the top end **78** of the cover **28** is moved down onto the base **26** from an open position to a closed position, the angled surfaces **56** on the ends **54** of the latching elements **52** engage the inner surface of the front wall **84** and back wall **86**, below the latch holes **70** on the cover **28**. Alternatively, the angled surfaces **56** on the ends **54** of the latching elements **52** may engage the angled surfaces **72** of ridges **71**, positioned below the latch holes **70** on the cover **28**, e.g., as shown in the embodiment of FIG. **10**. The latching elements **52** are somewhat resilient and can flex slightly under load in the longitudinal direction (along axis Y as shown in FIG. **1**). As a result, as the cover **28** is moved down into engagement with the base **26**, the latching elements **52** flex slightly inwardly toward each other. The angled surfaces **56** of the latching elements **52** and the inner surface of the front and back walls **84**, **86** below the latch holes **70** on the cover **28** or the angled surfaces **72** of the ridges **71** slide against each other and pass by each other. The latching elements **52** then flex back to near their original longitudinal positions, forcing the ends **54** of the latching elements through the latch holes **70** in the cover **28** and locking the cover **28** onto the base **26**. The catheter securing device **20** is then attached to the patient at the prepared securement site, usually via an adhesive pad. The securing device **20** then prevents virtually any movement of the catheter fitting **32** and adjoining catheter **30** within the securing device.

The catheter **30** may be removed by squeezing the squeezing arms **50** together, towards each other. One or both of the squeezing arms **50** may be resilient and flexible such that they may flex in the longitudinal direction. The squeezing arms **50** may be squeezed together by applying a force in the longitudinal direction, generally on the area of the grip ribs **59** located on the outer surface of the squeezing arm walls **57**.

Squeezing also causes the latching elements **52** on the squeezing arms **50** to move longitudinally toward each other, resulting in the ends **54** of the latching elements **52** moving back through and out of the latch holes **70**. The latching elements **52** move toward each other such that the cover **28** can be lifted away from the latching elements **52**. The angled surface **56** and angled surface **72** and/or inner surface of the cover **28** pass by each other as the cover **28** is pivoted up and off of the base **26**.

The securing device described above may be attached to a patient in a variety of ways. As shown in FIG. **1**, a base **26** may be attached to a pad **162** which is flexible to conform to the patient's arm or other site. The pad could be a hydro colloidal pad. The specific pad shape and size is not essential and various alternatives may be used. In FIG. **1**, the pad **162** is generally oval or round and it can also be a small footprint of a base **26**. The back side of the pad **162** preferably has one or more peelable strips over an adhesive layer or surface. The peel strips may be removed from the back of the pad **162**, and the pad placed onto a prepared securement site. A cut out **164** may be provided at the front of the pad **162** to allow the base **26** to be closer to the incision or catheter entry point. Alternatively, the securing device may be affixed directly to a patient by applying adhesive tape around the device and against the patient's arm or other site.

FIG. **10** shows another embodiment **90** of a universal securing device. Securing device **90** has a base **96** and a cover **98**. In this embodiment, as shown in FIG. **11**, the locating elements extending up from the base **96** are locating pegs **100** and each peg is surrounded by a ridge **102** at the base of the peg. A front pair **101** and back pair **103** of locating pegs extend from the base **96** and are arranged in a configuration to position and hold a catheter and catheter fitting of various shapes and sizes and prevent substantial movement of such catheters and catheter fittings in various dimensions, similar to locating elements **40** described above.

As with the locating elements **40** shown above in FIG. **3**, a first back locating peg **103** may be separated from a second back locating peg **103** by a dimension CC, while a first front locating peg **101** may be separated from a second front locating peg **101** by a dimension DD, as shown in FIG. **11**. In one embodiment dimension CC may be greater than dimension DD. In another embodiment dimension CC may measure about 0.35 to 0.39 inches, preferably 0.36 to 0.38 inches, or more preferably 0.37 inches in length and dimension DD may be about 0.28 to 0.32 inches, preferably 0.29 to 0.31 inches, or more preferably 0.30 inches in length. In another embodiment, dimension CC may be about 130-170% of dimension DD or more preferably about 140-160% of dimension DD.

In addition, in FIG. **11**, the locating pegs **100** positioned closest to the hinge block **62** and located above the arrow **49**, may be connected generally horizontally by a capture element **104**. The locating pegs **100** located below the arrow **49** and closest to the latching arms **50** may also be connected generally horizontally by a capture element **104**. Spikes **106** may extend up from the surface of the capture elements **104**. A semicircular trough **108**, running generally parallel to the lateral axis X of the base **96** and positioned in front of the locating pegs **100** (as indicated by the arrow **49**) may also extend up from the base **86**. The spikes may optionally extend up from the surface of the base **86** in an embodiment without capture element **104**.

As shown in FIGS. **12-13**, the cover **98** includes a first opening **110** in a front wall **114a** and a second opening **112** in a back wall **114b**. As best shown in FIG. **12** and with reference to the base **96** in FIG. **11**, provided on the under side of the cover **98** are locating pegs **100a** which are capable of fitting

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inside locating pegs **100** on base **96**. The locating pegs on cover **98** include a front pair **101a** and back pair **103a** of locating pegs, each with ridges **102a** as well as at least one capture element **104a** running between the locating pegs on the underside of the cover **98** arranged in a configuration that generally mirrors the configuration of locating pegs **100** and capture element **104** on the base **96**. Spikes **106a** may extend up from the capture elements **104a**. The front pair **101a** and/or back pair **103a** of locating pegs may be positioned in between or outside bars **80**, which are located on the underside of the cover **98** and run generally parallel to the lateral X axis (shown in FIG. 12). The capture elements **104** and **104a** may be spring molded. Also, if desired, at least one locating peg **100a** may be positioned at least partially on the surface of a bar **80**. At least one capture element **104a** may also be at least partially positioned on the surface of a bar **80**. Further, with reference to FIG. 10, ridges **71**, each having an angled surface **72**, may optionally be provided below latch holes **70**.

In one embodiment, the locating pegs **100a** on the cover are connected by a capture element **104a** which is positioned at an angle of about 1-45.degree. to a longitudinal Y axis across the underside of the cover **98** and locating pegs **100** on the base **96** are connected by a capture element **104** which is positioned at an angle of about 145.degree. to a longitudinal Y axis across the base.

The securing device **90** shown in FIGS. 10-15 operates in much the same way as the securing device **20**, shown in FIGS. 1-9 and described above. Additionally, as cover **98** closes onto a catheter fitting **116** (or other catheter fittings of various sizes) which is positioned between the locating elements and latches onto base **96**, locating pegs **100a** may align with and engage locating pegs **100** as shown in FIGS. 14-15. This helps prevent cover **98** from shifting or moving, making the latching mechanism between latching elements **52** and latch holes **70** even more reliable. Also, spikes **106** and **106a** are configured and arranged similar to the spikes in the embodiments of FIGS. 1-9 and described above. Thus, spikes **106** and **106a** help compress and grip catheter fittings of various shapes and sizes such as catheter fitting **32**, (e.g., by compressing the body and/or wings of the catheter fitting) securely holding the catheter fitting **32** in place and preventing substantial movement of the fitting in various dimensions as described above with respect to FIGS. 1-9.

In another embodiment, as shown in FIG. 48, a securing device **420** includes a base **426** and a cover **427**. The cover **427** may be removably or permanently attached to the base **426** by a hinge **450**. The base **426** includes an opening **430** configured to receive a retention plate **428** and a support plate **429** or seal plate or other structure suitable for holding or supporting the retention plate. The base **426** may include one or more restraining elements **431** attached to the top surface of the base **426** and extending at least partially over the opening **430**. The restraining elements **431** may be, e.g., pins, pegs, bars, walls, extensions, etc. The base **426** may optionally include one or more alignment pins **446** extending up from the top surface of the base **426** to help guide and align the cover **427** over a catheter or catheter fitting positioned on the retention plate **428** during closing.

The cover **427** may be temporarily or permanently coupled to the base **426** in a variety of ways. For example, as shown in FIG. 48, the base may include a hinge **450** which is configured to receive a pin **475**. The pin **475** is inserted through a pin hole **471** in the cover **427** and through the hole in the hinge **450**, thereby attaching the cover **427** to the base **426** such that the cover may rotate or pivot about the pin **475**. In another embodiment, as shown in FIGS. 51-53, the base **426** may include a groove **452** and bar **453**, and the cover **427** may

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include a tongue **451** or any other structures suitable for connecting the cover **427** to the base **426**. The tongue **451** may be substantially arc shaped or may have any other shape suitable for attaching to the bar **453** or other structure on the base **426**, or for inserting into the groove **452**. In one embodiment, the arc shaped tongue **451** may have a perimeter greater than 180.degree. The tongue **451** may be engaged, connected, or snapped onto the bar **453** and/or pressed into the groove **452**. The tongue **451** may rotate or pivot about the bar **453** or through the groove **452** when the cover **427** is moved into an opened or closed position, providing a type of hinge. Optionally, the tongue and groove or bar may provide a non pivotable or non rotatable connection.

Optionally, as shown in FIG. 51, a restraining arm **454** may extend from the base and be positioned near the bar **453** and groove **452**, in between the opening **430** and the bar **453** and groove **452**. A corresponding tab **455** may extend from the tongue **451**. As the cover **427** is rotated into an opened position, the tongue **451** may contact the restraining arm **454**, thereby stopping the rotation of the cover **427**, and preventing the tongue **451** from being disengaged from the bar **453**. The restraining arm **454**, which may be flexible or resilient, can be flexed in a horizontal direction allowing the tab **455** to slide past the restraining arm **454** and the tongue **451** may then be disengaged from the bar **453**. In other embodiments, the restraining arm **454** may be rigid and/or the cover **427** and base **426** may be permanently connected.

The base **426** may include one or more latching elements **480** positioned on the base **426** at an end generally opposite from the hinge **450** or other coupling structure. In one embodiment, as shown in FIG. 48, the latching elements **480**, which fit into receiving holes **481** on the cover **427**, may be connected to one or more squeezable arms **482** and operate to attach and detach the cover **427** to and from the base **426**, as described above, e.g., in the embodiments of FIGS. 1-15. The cover **427** and/or base **426** may optionally include a latch or any other suitable attachment or fastening structure or mechanism for removably fastening or attaching the cover **427** and base **426** together in the closed position without the use of squeezable arms.

As shown in FIGS. 48-49, the retention plate **428** preferably has a perimeter which is smaller than the perimeter of the opening **430** such that there remains some clearance between the perimeter of the retention plate **428** and the perimeter of the opening **430** when the retention plate **428** is positioned in the opening **430**. The clearance space may be provided around the entire perimeter of the retention plate **428**, around at least a portion of the retention plate **428** perimeter, or optionally no space at all may be provided around the retention plate **428** perimeter if the retention plate **428** is sized to fit against the perimeter of the opening **430**. The clearance or space allows for movement of the retention plate **428** in a variety of dimensions, including, e.g., along the longitudinal Y axis, along the lateral X axis, or vertically. In any embodiment the retention plate **428** may be a single piece, or it may be made up of two or more separate pieces as shown in FIG. 51. Optionally, the retention plate **428** may be positioned at least partially in the opening **430**. In other embodiments, the retention plate **428** may be positioned slightly above or below the opening **430**.

Optionally, extending up from the retention plate **428** are locating elements. In the illustrated embodiments shown in FIGS. 48, 49 and 51, the locating elements positioned at the front of the retention plate **428** (as indicated by the arrow **449**) each include a wall **441** connected to an elbow **442**, which is connected to a generally semicircular receiving area **443**. This receiving area **443** may optionally be any other shape or

design suitable for receiving a catheter, catheter fitting or other medical device. The locating elements positioned at the back of the retention plate **428** are in the form of locating pegs **444**, and they may optionally have ridges or ledges **445** extending therefrom. Optionally, the front and back locating elements may be in the form of, e.g., walls, ridges, pegs, pins or any combination of these. Optionally, the locating elements may be positioned substantially symmetrical, side-to-side about the longitudinal axis of the securing device **420** or centerline **Y**, or arranged or positioned in any manner suitable to hold, position or restrain catheters or catheter fittings of various shapes or sizes to prevent substantial movement of the catheters or catheter fittings in one or more directions. Optionally, the locating elements may be configured, arranged, or positioned relative to each other, as detailed in the embodiments discussed above and below, to accommodate, hold, or restrain catheters or catheter fittings of various shapes or sizes.

As shown in FIG. **48**, the support plate **429** preferably has a perimeter that is larger than the perimeter of the retention plate **428** but slightly smaller than the perimeter of the opening **430** such that the support plate **429** may be inserted into the opening **430**. The retention plate **428** is inserted into the opening **430** from the back side of the base **426** and the restraining elements **431** prevent the retention plate **428** from falling through the front side of the base **426** (See FIGS. **49-50**). The support plate **429** may be inserted at least partially into the opening **430** after the retention plate **428** has been inserted. The support plate **429** may be press fit into the opening **430** and held in place by friction to prevent the retention plate from falling through the back side of the base **426**. Optionally the support plate **429** may be affixed within the opening **430** or to the base **426** by welding, gluing, insert molding, or by any other method suitable for temporarily or permanently attaching the support plate **429** within the opening or to the base **426**. Alternatively, the support plate **429** may have a perimeter larger than the opening **430** and may be affixed to the bottom of the base **426** around the opening **430**.

The top surface of the support plate **429** may optionally be substantially flexible, cushioned, resilient or constructed in any manner suitable to allow for movement of the retention plate **428** in a dimension up or down or vertically, e.g., relative to the base **426** or securing device **420**. For example, such movement is permitted when the support plate **429** is attached to the base **426** and the retention plate is positioned on top of the support plate **429** and below the restraining elements **431**. Accordingly, the retention plate **428** is substantially free floating or movable, which allows the securing device **420** to accommodate catheters or catheter fittings of various shapes, sizes, or thicknesses. Indeed, to secure a catheter in the securing device **420**, a catheter is placed onto the retention plate **428** and the cover **427** is closed down over the catheter or catheter fitting. In one embodiment, the underside of the cover **427**, capture elements **460**, or pressure pins **461**, spikes or posts may contact, compress, hold, restrain, or apply a downward force on the catheter or catheter fitting. As a result, the retention plate **428** may also be forced downward against the top surface of the support plate **429** allowing the securing device **420** to hold, restrain or accommodate catheters or catheter fittings of various shapes, sizes, or thicknesses. In another embodiment the support plate **429** may be substantially rigid or the retention plate **428** may be substantially flexible, or both may be substantially rigid or flexible.

Furthermore, the securing device **420** may be attached to a patient in a variety of ways. For example, an adhesive pad, as described in the above embodiments or an adhesive tape may be used for attaching the medical device to a patient. For

example, an adhesive pad may optionally be attached to the base **426** or the support plate **429**. Optionally, any other suitable attaching method or structure may be used.

In another embodiment as shown in FIG. **54**, a securing device **520** configured to receive a catheter or catheter fitting, e.g., an IV (intravenous) catheter, IV hub, IV luer, IV adaptor or any other similar medical tubing or medical accessory or tubing as well as other catheters or catheter fittings for use in other applications, includes a base **526** and a cover **527**. The cover **527** may be removably or permanently attached to the base **526** by a hinge. The base **526** may optionally include one or more alignment pins **546** extending up from the top surface of the base **526** and positioned generally near the perimeter of the base **526** to help guide or align the cover **527** over a catheter **510** or catheter fitting positioned on the base **526** during closing of the securing device **520**. The alignment pins **546** may optionally serve to receive, capture, or restrain flanges, wings or other parts of a catheter or catheter fitting in certain embodiments.

Optionally, the base **526** may include one or more locating elements, e.g., locating pegs **544**, extending up from the surface of the base **526**. The locating elements may take on a variety of forms, e.g., walls, ridges, pegs, pins or any combination of these. The base **526** may also include a receiving area **547**. The receiving area **547** may be any shape or design suitable for receiving a catheter, a catheter fitting, e.g., a catheter hub **511**, or any other medical device. Optionally, the receiving area **547** may have a generally oval or rectangular shape. The receiving area **547** may also be indented, recessed, sloped, or generally concave. In one embodiment, the receiving area **547** may be generally contoured to match the shape of a catheter hub.

In the embodiment shown in FIG. **54**, the receiving area **547** is defined by a plurality of locating pegs **544**, arranged in rows on either side of the receiving area. The locating pegs **544** may optionally have ridges or ledges extending therefrom. In one embodiment, the locating pegs **544** are positioned from the back of the base **526** to the front of the base **526** (as indicated by the direction of the catheter **510**) in two rows forming a generally V-shaped or tapered arrangement suitable for receiving a standard catheter hub. In another embodiment, the locating pegs **544** may be arranged in rows running substantially parallel to the longitudinal **Y** axis of the device **520**. Optionally, the locating pegs **544** may be positioned substantially symmetrically or offset, side-to-side about the longitudinal axis of the securing device **520** or offset, side-to-side from each other. They may also take on a linear arrangement or an offset staggered arrangement, longitudinally along the base **526**. The locating pegs **544** may be arranged in any manner suitable to hold, position or restrain catheters or catheter fittings of various shapes or sizes to prevent substantial movement of the catheters or catheter fittings in one or more directions or dimensions, e.g., in an axial, side-to-side, back-to-front, up and down or rotational directions.

The base may also include two or more front locating pegs **548** and/or two or more back locating pegs **549** for receiving, capturing, or restraining the flanges **512**, wings or other parts on a catheter or catheter fitting. The front and back locating pegs, **548**, **549** may be spaced apart, side-to-side, by various distances to receive flanges, wings, or hubs of various shapes or sizes to help prevent movement of the catheter or catheter fitting in the longitudinal or lateral direction. Optionally, any of locating elements may be configured, arranged, or positioned relative to one another, as detailed in the embodiments discussed above and below, to accommodate, hold, or restrain catheters or catheter fittings of various shapes or sizes.

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In the embodiment shown in FIG. 54, the base 526 may be contoured to match the anatomy of a patient, e.g., the arm, leg, or scalp, depending on where a catheter or other medical tubing is to be inserted and where the securing device 520 is likely to be placed. The base 526 is preferably shaped and configured to allow the maximum amount of catheter fitting or needle exposure or extension beyond the perimeter of the base, while still securing the catheter fitting in place. Thus, luer locks and other connectable components may be conveniently attached to an end of a catheter fitting, such as a catheter hub, and the needle or catheter can be properly inserted into a patient. The thickness of the base 526 may optionally taper in the longitudinal direction, gradually decreasing from the back to the front of the securing device 520. The base 526 may slope generally in the longitudinal direction, from the back to the front of the securing device at an angle suitable to facilitate insertion of a needle or catheter into a patient. In one embodiment, the angle may be about 4.degree.-10.degree. or 5.degree.-9.degree. or 6.degree.-8.degree. Accordingly, a catheter fitting or catheter may be positioned on top of the sloped or angled base and be directed toward the patient at an angle that allows for optimum flow, delivery, or drainage of any fluid to and from a patient.

As shown in FIGS. 54 and 56, the cover 527 may include a first opening 567 in a front wall 565 and a second opening 568 in a back wall 566 through which the ends of the catheter or catheter fitting extend. A tab 570 may extend from the latching end 571 of the cover 527 to facilitate opening and closing of the cover 527. In one embodiment, the cover 527 includes one or more receiving openings 562 located generally in the center of the cover 527 for receiving tabs or other extensions on a catheter fitting (e.g., a hub) to help hold the catheter fitting in place and prevent substantial rotational, longitudinal, or lateral movement of the hub.

One or more tabs 564 optionally extend from the underside of the cover 527 and may be positioned in between or adjacent to one or more receiving openings 562. The tabs 564 may be configured to extend in between corresponding tabs or into indents on a catheter fitting or against the fitting to help restrain, grip, or hold the catheter fitting in place or against the base 526. One or more contact ridges 563 may extend from the underside of the cover 527 and may be generally arc shaped or have any shape suitable to engage a catheter fitting and restrain, grip, or hold the catheter fitting against the base 526. The contact ridges 563 are preferably positioned on the underside of the cover 527 in between a receiving opening 562 and the second opening 568 or first opening 567. Preferably, the receiving openings 562, contact ridges 563, and tabs 564 are in alignment with the first opening 567 and second opening 568 generally along the longitudinal Y-axis of the cover 527.

The cover 527 may also have one or more bars 569 which run in a direction generally parallel to the lateral X-axis, along the underside of the cover 527. The bars 569 may optionally run at an angle of, e.g., 1-45 degrees from the lateral X axis. The bars 569 provide support or stiffness to, or minimize distortion or deflection of, the cover 527 when it is moved into a closed position in which it applies pressure to a catheter fitting on the base 526. In the embodiment shown in FIGS. 54 and 56, the bar 569 runs parallel to the lateral axis and is positioned adjacent to the front opening 567, while the contact ridge 563 is positioned adjacent to the back opening 568. The center area of the bar 569 may be generally recessed to accommodate the heights of catheter fittings having various shapes and sizes.

The front and back openings 567, 568 of the cover 527 are configured to allow passage of catheters and catheter fittings

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of various shapes and sizes, while assisting with alignment and securement of the same. Preferably, the front and back openings, 567, 568 are contoured to accommodate catheter fittings having various shapes. The front and back openings 567, 568 are also of sufficient size such that attachments, such as luer locks, will abut against the outer perimeter of the openings to further prevent longitudinal movement or piston-ing of catheters and catheter fittings in the longitudinal direction. As shown in FIGS. 54 and 56, the center area of the cover 527 may be generally contoured, arched, or raised relative to the remainder of the cover 527 to accommodate catheter fittings of various sizes. Preferably, the center area of the cover 527 is angled in a manner that corresponds to the angle or slope of the base 526. In one embodiment, the angle is about 4.degree.-10.degree. or 5.degree.-9.degree. or 6.degree.-8.degree. Accordingly, a catheter fitting or catheter may be restrained in the securing device 520 in a manner that directs the needle or catheter toward the patient at an angle that allows for optimum flow, delivery, or drainage of any fluid to and from a patient.

Furthermore, the cover 527 may include one or more indents 572 in the front or back walls 565, 566 of the cover for receiving the alignment pins 546 and aligning the cover 527 on the base as the cover 527 moves into or rests in the closed position. The cover 527 also includes one or more latching holes 581 for receiving latching elements 580 on the base 526. The latching elements 580 extend from squeezing arms 582 on the base 526, or extend directly from the base 526 in a manner described above with respect to FIGS. 2 and 4, to securely hold or lock the securing device 520 in the closed position. Also, either one or both of the cover 527 and base 526 may be preloaded in order to bend, bow, flex, or deflect around an IV or other catheter fitting as the base or cover apply pressure to the catheter or catheter fitting to secure it in place and prevent movement in various directions when the securing device 520 is in a closed position.

In another embodiment, as shown in FIG. 57, one or more spikes 590, teeth, or other protrusions, may extend up from the receiving area 547 on the base 526. The spikes 590 are preferably made of metal or another hard substance suitable for pressing into, burrowing, or gripping a hard catheter fitting, e.g., a hub. The spikes may extend up directly from the receiving area 547, or they may be insert-molded into the receiving area. In one embodiment, a metal grid including a plurality of tiny teeth for gripping or biting into a catheter fitting may be inserted into the receiving area 547 of the base 526. When the cover 527 is closed down onto the base 526, the catheter fitting is forced against the spikes 590 which help to grip or hold the fitting securely in place. Optionally, as shown in FIG. 58, the cover 527 may include one or more spikes 590, teeth, or other protrusions, arranged in a configuration similar to the spikes 590 on the receiving area of the base 526. The spikes 590 on the cover 527 may also be insert-molded or may extend directly from the underside of the cover 527. Together, the spikes 590 on the cover 527 and base 526 press against the catheter fitting when the securing device is in the closed position, gripping and holding the fitting in place and preventing movement of the fitting in various directions or dimensions.

In another embodiment, as shown in FIGS. 59 and 60, the base 526 may include an opening configured to receive a retention plate 528 and a support plate 529 or seal plate or other structure suitable for holding or supporting the retention plate 528. The base 526 may include one or more restraining elements 531 attached to the top surface of the base 526 and extending at least partially over the opening in which the retention plate 528 or support plate 529 may be positioned.

The restraining elements **531** may be, e.g., pins, pegs, bars, walls, extensions, etc. The base **526** with opening, retention plate **528**, support plate **529**, and restraining elements **531** are configured and arranged in a manner as described above with respect to FIGS. **48-53**, to create a floating base. The base may optionally include alignment pins **546** arranged generally around the perimeter of the base. Extending up from the retention plate **528** are one or more locating elements, e.g., pegs, walls, etc., which may be configured or arranged around a receiving area **547** (see FIG. **60**) in any of the manners described above with respect to FIGS. **54-56**. Optionally, the retention plate may include one or more spikes, teeth, or other protrusions extending up from the receiving area **547** or insert molded into the receiving area **547** of the retention plate **528**, as shown in FIG. **57**.

In one embodiment, as shown in FIGS. **59** and **60**, the retention plate **528** may include locating elements in the form of two side walls **541** running generally parallel to the longitudinal Y axis on either side of the receiving area **547**, which may be any suitable shape for receiving a catheter or catheter hub, e.g., rectangular, oval, etc. The side walls **541** are connected to a front wall **532** having an opening or receiving area through which a catheter, needle, or catheter fitting may extend. The side walls **541** and front wall **532** are arranged to receive or hold a catheter or catheter fitting, e.g., a catheter hub, and prevent substantial movement of the same in various dimensions. The walls are positioned generally toward the front of the retention plate **528**, which is the side closest to the insertion site on a patient as indicated by the direction of the catheter **510**.

Extending up from the back or rear area of the retention plate **528** may be one or more tabs **533**. In one embodiment, a catheter fitting, e.g., a catheter hub, can be pressed onto or rest on top of the tabs **533**, which may also extend in between corresponding tabs extending from the catheter fitting or into indents on the catheter fitting to help hold or align the catheter fitting onto the retention plate **528**. The tabs **533** may be of various heights or sizes. Preferably, the tabs **533** are arranged side-by-side along the longitudinal axis, with each set of tabs **533** increasing in height from the front of the retention plate **528** toward the back of the retention plate **528** in order to support a catheter fitting at a preferred angle for directing a needle or catheter into a patient's skin. Optionally, the retention plate **528** may be angled or sloped as described above to have a similar effect. A contact ridge **563** may also extend up from the back of the retention plate **528**. The above arrangements of walls, tabs **533**, or contact ridge **563** may also be used with a non-floating base like the one described above in FIGS. **54-56**.

The cover of the embodiment shown in FIGS. **59** and **60** may include one or more receiving openings **562** or bars **569**. Extending from the bar **569** may be a contact ridge **563** for contacting a catheter hub or other catheter fitting and applying pressure to the catheter hub when the device is in the closed position. The cover **526** can rotate down onto the base by a hinge mechanism and latch into a closed position as described in the embodiments above. Optionally, the cover may be snapped onto the base for attachment.

In another embodiment, as shown in FIGS. **61** and **62**, the securing device **521** may include a base **526** and a cover **527**. One or both of the surface of the base and the underside of the cover may be smooth or flat. The base or cover may apply pressure to the catheter fitting when the securing device is in the closed position, thereby holding or securing the catheter or catheter fitting in place and preventing movement in various directions or dimensions. Optionally, one or more locating elements **540** may extend up from the base **526** to receive,

hold, or align the catheter or catheter fitting in place or to hold the flange or wings of a catheter fitting and prevent longitudinal or lateral movement of the fitting. Alignment walls or bars may also extend up from the base. The front walls of the base **526** and cover **527** may be generally arched or curved such that the front end of the catheter fitting remains in close proximity to the patient. Furthermore, the floating base configuration described above with reference to FIGS. **59** and **60** may be implemented in any of the embodiments shown in FIGS. **54-58** and **61-62**.

In any of the above embodiments, the base **526** may be permanently or removably attached to the cover **527**. The cover **527** may rotate onto and off of the base using any of the hinge mechanisms or snapping attachments described above. Additionally, as shown in FIGS. **55** and **56**, the cover **527** may include an inner cam **557** or tongue and generally rounded outer cams **558**. The inner cam **557** is attached to a bar **553** around which it may pivot or rotate. The bar **553** serves to center, align, stabilize, or locate the cover **527** on the base **526** to prevent substantial side-to-side movement as it rotates. As the cover **527** rotates, the outer cams **558** engage the corresponding rounded follower surfaces **559** on the base **526** which also serves to center, align, stabilize, or locate the cover **527** as it rotates. A tab **555** extending from the inner cam **557** may engage the ridge **556** on a restraining arm **554** which extends from the base to prevent over rotation of the cover **527** or detachment of the cover **527** when it is in the open position. Overrotation or removal may be performed by applying additional force to slide the tab **555** past the ridge **556**.

In an embodiment of the securing devices described above, the securing device may limit the axial motion of an IV Hub or other catheter fitting or catheter to ± 1.5 mm. The securing device may secure an IV Hub to within its travel limit when subjected to a pull force of up to about 3 lbs in any direction on any one of its tubes or catheters. The securing device may not open when any one of the tubes or catheters is pulled with a force up to about 3 lbs in any direction and the cover shall remain secured with up to about 5 lbs of applied force in any direction. An adhesive Tricot may be bonded to the bottom surface of the securing device for attachment to the patient's skin and the base shall not separate from the adhesive with less than about five lbs of force. The cover may optionally be clear to allow a user to view the IV hub once the device is closed. The base may also be clear. The securing device may have an arrow molded or printed on the base or cover to indicate the direction of flow toward the catheter distal end and aiding in orienting the catheter when it is put in place. The cover may open with a maximum applied force from the user of about 5 lbs to the tab. The cover may close with a maximum applied force from the user of about 4 lbs.

In another embodiment, as shown in FIGS. **63** and **64**, a securing device **610** includes a base **611**. A receiving area **612**, which may be substantially arc shaped, semi-cylindrical, or generally contoured to receive or hold a catheter hub or other catheter fitting, may be positioned on the center of the base **611**. The receiving area **612** may be flexible or resilient to accommodate various catheter fittings. The receiving area **612** extends generally along the longitudinal Y axis and is bordered on either side by restraining walls which run generally parallel to the longitudinal Y axis. Preferably, one restraining wall **613** is fixed and the other is movable, forming a swinging gate **613a**. The fixed wall **613** may optionally be a separate piece or an extension of the receiving area **612**. The swinging gate **613a** may open by applying pressure to a deflectable, resilient, flexible, or spring loaded tab **616** or other latching mechanism to disengage the tab **616** from the swinging gate such that the swinging gate **613a** may pivot or

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rotate in the lateral direction, away from the receiving area 612. A catheter or catheter fitting may then be positioned onto the inner surface 617 (shown in FIG. 63) of the receiving area 612 which faces away from a patient when the securing device is positioned on a patient. In one embodiment, the inner surface 617 of the receiving area 612 may include one or more receptacles 615 (shown in FIG. 63) or indents for receiving tabs or other extensions on a catheter hub or other catheter fitting to hold the catheter in place on the securing device 610 and prevent substantial longitudinal movement or movement in other directions or dimensions.

Once the catheter hub is in place, the swinging gate 613a is rotated back toward the receiving area 612. The swinging gate engages the tab 616 and slides past the tab 616, which can flex slightly under the load and then return to its original position, latching or locking the swinging gate 613a into place and securing the catheter fitting within the receiving area 612. In another embodiment, the securing device may be designed such that the base 611 includes two parts extending from either side of the receiving area 612, where the bottom surface of the receiving area and/or the bottom surface of the base 611 are attached to an adhesive pad or a patient. Optionally, the base 611 is contoured to the anatomy of a patient or is slightly resilient or flexible to form to the anatomy of a patient. A pad 605 may be attached to the underside of the base 611 to adhere the device to a patient.

In another embodiment, as shown in FIGS. 65-67, a securing device 630 includes a base 631. Extending up from the base are one or more tracks 633 which run parallel to the lateral X axis. The tracks 633 are separated by a receiving area 632 for receiving catheters and catheter fittings of various shapes or sizes. One or more movable or slidable clamps 641 are connectable to the tracks 633. The top surface of the tracks 633 include ribs 634. The underside of the clamps 641 include one or more teeth 636 positioned within a recessed indent 639. The indent 639 runs along the lateral X axis and is configured to receive a track 633. The clamps 641 may be attached to the tracks 633 by inserting a track 633 into the indent 639 of the clamp 641, thereby allowing the teeth 636 to engage the ribs 634.

The top surface of the clamp 641 includes a fixed tab 638 and a push tab 637. The push tab 637 is connected to a retention wedge 640 which extends from the underside of the clamp 641 and is spring loaded or flexible or resilient such that it is forced or pressed against the track 633, allowing the clamp 641 to be held in a fixed position. The push tab 637 may be pushed toward the fixed tab 638 in the longitudinal direction, which causes the retention wedge 640 to flex away from the track 633, at which time the clamp 641 may be moved or slid along the lateral X axis either away from or toward a catheter fitting positioned within the receiving area 632. The ribs 634 and teeth 636 interact with each other to create a ratchet like mechanism, which provides different settings for positioning, locking, or holding the clamps 641 in relation to each other. The clamps may be adjusted or restricted to each rib 634 or notch on the track 633 to accommodate catheter fittings of different shapes or sizes.

In operation, one or more clamps 641 are pushed or slid toward each other along the tracks 633 toward a catheter fitting to clamp or hold the catheter fitting in place. The retention wedge 640 or ratchet mechanism of the ribs 634 and teeth 636 may hold or lock the clamps 641 in place and restrict further movement unless desired. In the closed position, contact bars 635 apply pressure to the catheter or catheter fitting, e.g., catheter hub, to securely hold the catheter or catheter fitting in place and prevent movement in various dimensions or directions. Likewise, one or more clamps 641 may be

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moved or slid along the tracks 633 away from each other in order to release the restrained catheter fitting. Also, the clamps 641 include slits 642 for receiving tabs or other extensions on a catheter hub or catheter fitting when the clamps 641 are in the closed position to prevent longitudinal, lateral, or other types of movement. Further, flanges or wings on a catheter fitting positioned within the receiving area 632 may abut against the tracks 633 to further prevent movement of the catheter or fitting in the longitudinal direction. In any of the above embodiments, the base may be generally V-shaped, see e.g., FIG. 65, in order to position the hub or catheter fitting in close proximity to the patient to facilitate ease or convenience of use.

In FIG. 68, another variation of the embodiments in FIGS. 65-67 is shown. Here, the securing device 630 operates in a similar manner as described above, however the design of the securing device is varied. The push tab 637 and fixed tab 638 are oriented in planes that run substantially parallel to the plane of the base 631, rather than in planes that are substantially perpendicular to the base. This provides a securing device with a lower overall profile. The push tab 637 operates by being pushed against the fixed tab 638 in order to flex the retention wedge or teeth on the underside of the clamps away from the track and ribs, thereby allowing the clamps to be slid or ratcheted along the tracks into an opened or closed position.

In another embodiment, as shown in FIGS. 69 and 70, a securing device 660 includes a base 661. The base includes a track 663. Positioned on the base 661 are one or more clamps. One or more of the clamps may be movable. In one embodiment, there is a movable clamp 668 and a fixed clamp 668a. Extending from the movable clamp 668 in a direction toward the fixed clamp 668a is a ratchet arm 665, which is positioned within the track 663. The end of the ratchet arm 665 may have ribs 664 on its upper surface. Restraining walls 669 are positioned on the inner surface of the clamps to grip or hold catheters or catheter fittings of various sizes in place.

In operation, the movable clamp 668 is pushed toward the fixed clamp 668a such that it rotates about a pin 667 or other suitable rotational or hinge mechanism. As the clamp 668 is pushed, the ribs 664 on the ratchet arm 665 engage teeth or corresponding ribs on the underside of the fixed clamp 668a. The ratchet arm and clamp move within the track by being slid or ratcheted toward the fixed clamp 668a. The clamps, in a closed position, hold a catheter fitting positioned on the base 661 thereby securing it in place. The ratchet mechanism may hold or lock the movable clamp 668 in place at different intervals or notches to accommodate catheters or catheter fittings of various shapes or sizes.

The catheter or catheter fittings are held in place by the restraining walls 669 on the inner surface of the clamps. The restraining walls 669 may be made of foam or other moldable material which conforms to the shape of the catheter fitting to hold it in place. Teeth, spikes, any type of capture element, or any material suitable to hold catheter fittings may also extend from or line the restraining walls 669 or inner surface of the clamps to hold or grip various catheter fittings. To release the clamps from a catheter fitting, the end of the ratchet arm 665 can be pressed down toward the base, thereby disengaging the ribs 664 to teeth connection and allowing the movable clamp 668 to slide away from the fixed clamp 668a.

In another embodiment, as shown in FIGS. 71 and 72, a securing device 680 for securing various IV luer locks, J-loop locks, luer locks, and other catheter fittings includes a base 681. Positioned on the top surface of the base 681 is a first receiving area 682 having a substantially cylindrical shape with an opening 686. Adjacent to the first receiving area 682

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is a platform **685** with a second substantially smaller receiving area **683** extending from the platform **685**. The second receiving area **683** is also substantially cylindrical in shape with an opening **687**. The second receiving area **683** may include grooves **684** which are configured to receive or grip a luer lock or other fitting attached to an IV catheter hub or other catheter or catheter fitting when the catheter hub is placed within the first and second receiving areas and securely held in place to restrict substantial movement of the catheter. Optionally, as shown in FIG. 72, swivel arms **689** may extend from both the first and second receiving areas **682**, **683**. The swivel arms **689** attach to a ridge **688** along the top of a trunk **690** such that the receiving areas can rotate or swivel about the ridge **688** or trunk **690**.

In another embodiment, as shown in FIGS. 73 and 74, a securing device **700** includes a base **701** and two receiving areas **702**, **703** having substantially cylindrical shapes which extend from a platform **704**. The securing device **700** is suitable to hold or restrain a J-loop lock, luer lock, or other catheter fitting. For example, a J-loop lock or other catheter fitting may be positioned within the receiving areas **702**, **703**, and rest on the top surface of the platform **704**. An arm **706** of a J-loop lock may extend through the space between the two receiving areas and be held or locked in place within a groove **705** to prevent movement of the J-loop lock. The arm **706** may be held by a groove **705** positioned anywhere on the end of the receiving area **702** such that the J-loop lock can be positioned at different angles.

Additional embodiments for securing a J-loop lock, luer lock, or other catheter fitting are shown in FIGS. 75-77. FIGS. 75 and 76 show a securing device **710** with a base **712** and a dome **711** extending up from the base. A J-loop lock can be positioned within the dome **711** such that an arm of the J-loop lock is slid into the side slit **714** and into the groove **715** to be held or locked into place. A plate **713** (shown in FIG. 76) within the dome **711** also serves to restrain a J-loop lock or other catheter fitting positioned in the dome **711** as the catheter fitting abuts against the plate **713**, preventing movement in the longitudinal direction and locking or holding the catheter fitting in place against the plate **713**. The dome **711** has an opening on either end to allow for passage of the catheter. FIG. 77 shows a securing device **720** which includes a base **721** and a slidable receiving plate **723** for holding or restraining a J-loop or other catheter fitting. The J-loop, for example, one made of injection molded hard plastic, can be attached to the retention groove **724** in the receiving plate **723** and the receiving plate **723** may be slid onto the base **721** and locked or held to the base **721** by the flex locks **722**.

Another embodiment for securing catheter fittings such as IV catheter hubs of various shapes or sizes is shown in FIG. 78. The securing device **730** includes a ring clasp **732** and base flanges **731** extending from the ring clasp **732**. The ring clasp **732** is made of two halves which can pivot open and closed about a center joint **733**. A first half **734** of the ring clasp **732** has a ridge **736** which engages a locking area **737** on the second half **735** of the ring clasp **732**. This locking mechanism serves to hold the ring clasp **732** in the closed position when a catheter or catheter fitting is positioned therein, in order to prevent movement of the catheter or securely hold it in place. Optionally, the locking mechanism may operate by snapping a resilient or flexible ridge **736** into the locking area **737**.

Furthermore, any of the securing devices may be attached to a patient in a variety of ways. For example, an adhesive pad, as described in the above embodiments or an adhesive tape may be used for attaching the securing device to a patient. For example, an adhesive pad may optionally be attached to a

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base or to a support plate. Optionally, any other suitable attaching method or structure may be used.

Another embodiment of a securing device **124** is shown in FIGS. 16-20. As best shown in FIG. 17, grooves **130** are provided on cover **128** which help make the cover more flexible. A latch **132** and snap hinge **136** are centered at opposite sides of the cover **128**, along the lateral X axis of the cover **128**. Web sections **140** run generally parallel to a longitudinal Y axis between column legs **144** and between grooves **130** on the under side of the cover **128**. The web sections **140** include a capture element **142** and elevated ends **145** extending from the web sections **140**.

As shown in FIG. 19, the device **124** may also include a base **126**. The locating elements **150** on the base **126** include a front pair **152** and a back pair **154** of locating elements arranged in a front to back direction as indicated by arrow **49**. In general, the locating elements **150** may be substantially symmetrical side-to-side about the longitudinal axis or centerline Y. The locating elements **150** help restrain a catheter and catheter fitting of various shapes and sizes and help prevent substantial side-to-side, back-to-front, axial and rotational movement of such catheters and catheter fittings on the base **126**. At the foot of a locating element **150** is a ridge **155** and positioned in between the front pair **152** and back pair **154** of locating elements is a bar **157** running on either side of the arrow **49** and generally parallel to arrow **49**. A bottom latch **159** and snap hinge base **158** are centered at opposite sides of the base **126**, along the lateral X axis of the base **126**. Side walls **156** may extend up from the base along the perimeter of the base **126**.

In one embodiment the locating elements **150** are arranged such that a front locating element **152** is separated from a back locating element **154** by a dimension EE which extends from the inner tip of **152** straight back and perpendicular to **154**. Also, the inner edge of the first or right back locating element **154** may be separated from the inner edge of the second or left back locating element **154** by a dimension GG running generally parallel to a lateral axis X. Also, the inner edge of the first or right front locating element **152** may be separated from the inner edge of the second or left front locating element **152** by a dimension HH running parallel to dimension GG. In one embodiment, dimension GG may be greater than dimension HH. In another embodiment dimension GG may be about 130 to 170% of dimension HH or more preferably about 140 to 160% of dimension HH.

As shown in FIG. 20, the device **124** operates such that the cover **128** is attached by the snap hinge **136** to the snap hinge base **158** of base **126** and the cover **128** can rotate down onto the base **126** into a closed position where the latch **132** and bottom latch **159** engage. In a closed position the capture element **142** on the web sections **140** is adapted to contact and compress the top of a catheter fitting held within device **124**. The capture elements **142** help compress and grip catheter fittings of various shapes and sizes (e.g., by compressing the body and/or wings of a catheter fitting) securely holding the catheter fitting in place and preventing substantial movement of the catheter fitting such as in an axial, side-to-side, back-to-front, up and down and rotational direction. The capture elements may compress the catheter fitting against the ridge **155** and/or bar **157**. The ends **145** of the web sections **140** serve a similar function as the locating elements discussed above as they also help restrain a catheter fitting and help prevent substantial side-to-side, back-to-front, axial and rotational movement of the catheter fitting. The web sections **140** including capture elements **142** and ends **145**, as well as bars **157** and ridges **155**, may be solid or spring molded and may be made of various materials as discussed above. Optionally, a

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base with no locating elements may be used with the cover **128** for compressing and holding a catheter.

FIG. **21** shows securing device **170** having a base **176** and cover **178**. The device is attached to an adhesive pad **162**. This embodiment operates much like the embodiments of FIGS. **16-20** described above for securing catheters and catheter fittings having various shapes and sizes. The base **176** and cover **178** may snap fit together with or without a hinge feature.

FIGS. **22-29** show the universal catheter securement device **20** in use with various different types of catheters. With some catheters, as shown in FIGS. **22, 24, 27** and **29**, the wings **200** of the catheter **32** are restrained against virtually any longitudinal movement by the front and rear locating elements. With other catheters, such as shown in FIGS. **23, 26** and **28**, the wings **200** of the catheter are narrower or smaller, leaving a gap between the locating elements. This would nominally allow the catheter to shift longitudinally under force (e.g., with pulling on the catheter tubes). However, when the cover is closed, the catheter body **202** and/or the wings are clamped tightly by the capture elements. This largely prevents any extensive inadvertent and undesirable movement of the catheter, even though there may be no direct physical contact with a front or rear locating element.

FIG. **30** shows an alternative embodiment of a base **180** for use in a securing device. The locating elements **182** on the base **180** include at least one front wall **183** and a pair of back walls **184** arranged in a front to back direction as indicated by arrow **49**. In general, the locating elements **182** may be substantially symmetrical side-to-side about the longitudinal axis or centerline **Y** and they are arranged to position and hold catheter and catheter fittings of various shapes and sizes to prevent substantial movement of such catheters and catheter fittings in various dimensions. The front wall **183** may be angled and a semicircular trough **185** may be positioned slightly forward of the front wall **183** and may be connected to the front wall. The back wall **184** is connected to a post **186**. A bottom latch **187** and snap hinge base **188** are centered at opposite sides of the base **180**, along the lateral **X** axis of the base **180**. The base **180** may snap fit to a cover with or without a hinge feature. Side walls **189** may extend up from the base along the perimeter of the base **180** and spikes **190** may extend up from the base and run in a line on either side of arrow **49**, between a front wall **183** and back wall **184**. The base **180** can operate in conjunction with a cover in a manner to compress and/or restrain catheters and/or catheter fittings of various shapes and sizes and prevent their substantial movement in various dimensions.

In one embodiment the locating elements **182** are arranged such that a front wall **183** is separated from a back wall **184** by a dimension **JJ** which extends from a mid-point on an inner surface of the front wall **183**, straight back and generally parallel to the longitudinal axis **Y**, to the post **186**. A front wall **183** may also be separated from a back wall **184** by a dimension **KK** which extends from the outer edge of the front wall **183** to the outer edge of the back wall **184**. Also, a first or right post **186** may be separated from a second or left post **186** by a dimension **LL** running generally parallel to a lateral axis **X**. Further, a semicircular trough **185** may have a dimension **MINI** running generally parallel to dimension **LL**. In one embodiment, dimension **JJ** is greater than dimension **KK**. In one embodiment, dimension **LL** is greater than dimension **MM**. In another embodiment dimension **JJ** may measure about 0.33 to 0.37 inches, preferably 0.34 to 0.36 inches, or more preferably 0.35 inches in length and dimension **KK** may measure about 0.31 to 0.35 inches, preferably 0.32 to 0.34 inches, or more preferably 0.33 inches in length. Also, dimen-

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sion **LL** may measure about 0.41 to 0.45 inches, preferably 0.42 to 0.44 inches, or more preferably 0.43 inches in length and dimension **MINI** may be about 0.15 to 0.19 inches, preferably 0.16 to 0.18 inches, or more preferably 0.17 inches in length.

In an alternative design, the device may use a generally plane cover and base, with the device not having locating elements **40** and/or spikes **48**. In this design, the cover and base act as simple clamping elements to secure the catheter. With sufficient clamping force applied, the cover and base can restrain the catheter against significant movement, without using locating elements, such as walls, posts, etc. Force multiplying elements, such as levers, cams, screw threads, etc. may be used in this type of design to provide adequate clamping force.

The above securing devices may be molded plastic or made of other materials suitable for use with patients. Any of the bases or covers described may be provided in the shapes shown or in other shapes as well, including irregular shapes. Outer walls extending up from a base around the outside of the locating elements may also be provided to help align and engage a cover onto a base. Also, the various embodiments of securing devices described above may be attached to a patient in a variety of ways, e.g., with a pad as shown in FIG. **2**, or with other adhesive means.

In other embodiments, a securing device for holding catheters and the like in place advantageously has two parts. A base attached to a pad forms one part. A cover is the other part. The cover may optionally be tethered to the base. The pad preferably has an adhesive back surface for attaching the pad to the patient's skin. The base on the pad has positioning elements such as walls or surfaces adapted to fit securely around a catheter fitting. The catheter fitting may be placed into or onto the base from above. The positioning elements prevent any substantial movement of the catheter fitting, in two dimensions, relative to the base or pad, e.g. in the front/back and left/right side directions. The cover is attached to the base over the catheter fitting. One or both of the base and cover have latching elements for holding the cover onto the base. The cover prevents movement of the catheter fitting in a third dimension, i.e., vertically up and out of the base. Consequently, after the cover is attached to the base over the catheter fitting, the catheter fitting and the catheter are securely held in place on the patient. The catheter may be released and removed from the base by temporarily disengaging the latching elements. The latching elements may be disengaged by, for example, squeezing the sides of the cover. The catheter can therefore be quickly and easily attached to or removed from the patient. Such devices may be used with, e.g., PICC lines, IV catheters, Foley catheters, heart catheters, J-loops, and various other catheters, as well as tubes, cables, lines, and other medical devices.

For example, FIG. **31** shows an embodiment of a securing device **320** having a base **326** attached to a pad **322**. The pad **322** is flexible to conform to the patient's arm or other site. The back side of the pad **322** preferably has one or more peelable strips over an adhesive layer or surface. The specific pad shape and size is not essential and various alternatives may be used. In the example shown in FIG. **31**, the pad **322** generally is oval or round, and with a major diameter of from about 1-6, 2-5 or 3-4 inches. The pad does not need any suture holes.

As shown in FIGS. **31-34**, a base is attached onto the top side of the pad **322** at a generally central location. The base **326** has positioning walls **350** shaped and dimensioned to fit securely around a fitting **332** on a catheter **330**. For the catheter **330** shown in FIGS. **32** and **33**, four separate positioning

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walls 350 are used. In this case, the catheter walls 350 are adapted to fit around the curved ends of the fitting plate. The walls 350 are spaced apart in the back to front direction (indicated by the arrow 356 in FIG. 32) by a dimension just nominally greater than the width of the fitting plate 334. Similarly, the walls 350 are spaced apart side to side by a dimension nominally greater than the length of the fitting plate.

Referring to FIGS. 32-34, outer walls 352 extend up from the base 326 around the outside of the positioning walls 350. The outer walls are lower than the positioning walls. Latching arms 340 extend up generally from opposite sides of the base 326. An angled face or surface 344 is provided at the top or head 342 of each of the arms 340. The base 326 may have a tapered or inclined edge or rim 354. One or more through holes 346 may be provided in the base 326, if desired, for manufacturing purposes. An arrow symbol 356 may be provided on the base 326 and/or the cover 328, to indicate how the catheter 330 should be installed into the device 320.

As shown in FIGS. 32 and 35, the cover 328 has latching arms 366, with an angled surface or face 370 at the outer or lower end 368 of each arm 366, similar to the latching arms 340 on the base 326. In the oblong cover 328 shown in FIG. 35, the arms 366 are centered at opposite sides of the cover, along the major axis of the cover. Web sections 362 run between column legs 360 on the bottom or under side of the cover 328. The column legs extend out beyond the latching arms 366. A contact or land surface or area 364 on the web sections 362 are adapted to lightly contact the top of the catheter fitting 332 when the cover 328 is attached to the base 326.

In use, after the catheter has been placed, the skin at the securement site is preferably cleaned. The catheter fitting 332 is then placed into or onto the base 326, as shown in FIG. 33. Land or boss areas 351 may be provided on the floor of the base 326, within the positioning walls 350, as shown in FIGS. 33 and 33. These areas 351 may be used, if desired, to support the catheter fitting 332 off of the floor of the base 326. The cover 328 is then attached to the base 326 over the fitting 332, as shown in FIG. 31. The outer walls 352 may align with and engage against inner rim surfaces 365 on the cover 328, as shown in FIG. 35. This interaction, if used, helps to align the cover onto the base, and to securely attach the cover to the base. The column legs rest on flat outer areas of the base.

The column legs 360 are dimensioned so that when they bottom out on the base 326, the contact surfaces 364 rest on the catheter fitting 332. The legs 360 prevent crushing or deformation of the catheter fitting, by keeping the contact surfaces 364 at a specified dimension above the base floor. As a result, the catheter fitting cannot be crushed, even if the cover is forcefully clamped down onto the base. The fitting 332 is securely held in place (horizontally) on the base between the positioning walls and is held in place vertically between the floor of the base 326 and the contact surfaces 364 of the cover.

As the cover is moved down onto the base 326, the angled surfaces 344 on the base latching arms 340 engage the angled surfaces 370 on the cover latching arms 366. This provides for a cover self aligning operation. The arms 340 and 366 are somewhat resilient and can flex slightly under load in the lateral direction. As a result, as the cover is moved into engagement with the base, the base latching arms 340 flex slightly outwardly, and the cover latching arms flex slightly inwardly. The surfaces 344 and 370 of the arms 340 and 366 slide against and then pass by each other. The arms 340 and 366 then flex back to near their original lateral positions, locking the cover 328 onto the base 326. The peel strip(s) are

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removed from the back of the pad 322, and the pad is placed onto the prepared securement site. The device 320 then prevents virtually any movement of the catheter fitting 332, which is joined to or part of the catheter 330. A cut out 324 may be provided at the front of the pad 322 to allow the base 326 to be closer to the incision or catheter entry point.

The catheter 330 may be removed by squeezing the sides of the cover 328 towards each other. The cover 328 is slightly flexible. Squeezing causes the cover to curve or bow up. As the cover curves, the arms 366 are drawn inwardly enough to pull the ends 368 of the arms 366 on the cover 328 away from the ends 342 of the arms 340 on the base 326. The head or ends 342 and 368 can then pass by each other as the cover is lifted off of the base.

FIGS. 36-38 show another embodiment of a securing device 380 for use with a catheter 390 and catheter fitting 392. The cover 388 has curved contact surfaces 364 matching the top of the fitting 392. The base 386 has positioning walls 350 adapted to fit around the fitting 392.

FIGS. 39-42 show another embodiment of a securing device 400 for use with another type of catheter 410 and catheter fitting 412. As shown in FIG. 40, the positioning walls 350 on the base 406 are segmented. The cover 408, as shown in FIG. 42, includes an opening 416 in a rear wall 414.

FIGS. 43-45 show another embodiment of a securing device 415 for use with yet another type of catheter 440 and catheter fitting 417. In this design, four positioning walls 350 are provided on the base 436. Grooves 418 may be provided on the cover 408 to make the cover more flexible. As shown in FIGS. 41, 43 and 46, ramps or ridges 413 may be provided on the base floor near or adjoining one or more of the positioning walls 350. These features may be used to set the orientation of the catheter fitting in the device. FIGS. 46 and 47 show a base 419 similar to the base 436 shown in FIG. 43. The base 419 is generally oval shaped as opposed to the more rectangular base 436 shown in FIG. 43.

The devices shown in FIGS. 36-47 operate in the same way as the device 320 shown in FIGS. 31-35 and described above. The base and cover in each design may be molded plastic. The positioning walls 350 may be segmented, as shown in the drawings, or continuous. Indeed, a single continuous positioning wall surrounding the catheter fitting 417 on all sides may be used. Alternatively, multiple short spaced apart wall segments around two, three or more sides of the fitting may also be used. The wall segments may be various shapes, including generally rectangular, as shown in FIGS. 45-47, as well as round, square, hexagonal, etc. Positioning or locating elements, such as the walls 350, may optionally also be provided on the cover. Moveable or adjustable positioning elements or wall segments may also alternatively be provided on the base. If used, these may have a single direction or ratchet feature, so that they can move only inwardly to contact the sides of the catheter fitting. Moveable positioning elements may allow use of a single device with more than one specific type of catheter.

Any of the above-described embodiments and elements described in the embodiments may be used alone or in combination with one another. For example, a hinge, or tongue and groove or bar connection mechanism for permanently or non-permanently connecting a cover to a base could be used with any of the above described bases. Furthermore, the securing device may include additional features not described herein. While several embodiments have been shown and described, various changes and substitutions may of course be made, without departing from the spirit and scope of the invention.

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What is claimed is:

1. A device for securing a catheter on a patient, the device comprising: a base including a receiving area and a plurality of locating elements disposed on the receiving area for positioning a catheter; a recessed region disposed in the receiving area, the recessed region being formed below a top surface of the base for receiving at least a portion of the catheter; a plurality of teeth extending upwardly from the recessed region for engaging the catheter; a cover connected to the base and movable between an open position and a closed position, the cover and base forming a channel for receiving at least a portion of the catheter when the cover is in the closed position, the cover comprising at least one contact element and at least one opening, the at least one contact element being disposed on an interior surface of the cover and extending into the channel, the at least one contact element being configured to contact a top surface of the catheter when the cover is in the closed position, the at least one opening being configured to receive a portion of the catheter when the cover is in the closed position; and at least one latching element for securing the base to the cover in the closed position.

2. The device of claim 1, wherein the cover is removably connected to the base.

3. The device of claim 2, wherein the cover includes a tongue and the base includes a bar about which the tongue is pivotable.

4. The device of claim 3, further comprising a restraining arm on the base, wherein the tongue includes a tab for engaging the restraining arm when the cover is in the open position to substantially prevent the cover from separating from the base.

5. The device of claim 1, wherein the base includes an angled surface for maintaining the catheter at an intended angle relative to the patient.

6. The device of claim 1, wherein the base includes an opening in which a retention plate is movably retained.

7. The device of claim 6, wherein the locating elements and the receiving area are located on the retention plate.

8. The device of claim 1, wherein the locating elements comprise a plurality of upwardly extending walls.

9. A device for securing a catheter having an elongated body and a plurality of wings extending from the body, the device comprising: a base including a receiving area and a plurality of pegs disposed on the receiving area for raising at least a portion of the elongated body above the base; a recessed region disposed in the receiving area, the recessed region being formed below a top surface of the base for receiving at least a portion of the catheter; a plurality of teeth extending upwardly from the recessed region for engaging the catheter; a cover connected to the base and movable between an open position and a closed position, the cover and the base forming a channel when the cover is in the closed position, the cover comprising at least one contact element extending into the channel, the at least one contact element

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being configured to contact a top surface of the elongated body when the cover is in the closed position; and at least one latching element for securing the base to the cover in the closed position.

10. The device of claim 9, further comprising at least one opening, the at least one opening being configured to receive a portion of the catheter when the cover is in the closed position.

11. The device of claim 9, wherein the cover is removably connected to the base.

12. The device of claim 11, wherein the cover includes a tongue and the base includes a bar about which the tongue is pivotable.

13. The device of claim 12, further comprising a restraining arm on the base, wherein the tongue includes a tab for engaging the restraining arm when the cover is in the open position to substantially prevent the cover from separating from the base.

14. The device of claim 9, wherein the plurality of teeth extend upwardly into the receiving area for area for engaging the catheter, the plurality of teeth being disposed between the plurality of pegs.

15. A device for securing a catheter having an elongated body and a plurality of wings extending from the body, the device comprising: a base including a receiving area and a plurality of locating elements disposed on the receiving area, the plurality of locating elements including at least a front locating element and a back locating element, the front and back locating elements being disposed on the base so as to contact each of the plurality of wings; a recessed region disposed in the receiving area, the recessed region being formed below a top surface of the base for receiving at least a portion of the catheter; a plurality of teeth extending upwardly from the recessed region for engaging the catheter; a cover connected to the base and movable between an open position and a closed position, the cover and base forming a channel for receiving at least a portion of the catheter when the cover is in the closed position, the cover comprising at least one contact element extending into the channel, the at least one contact element contacting a top surface of the body when the cover is in the closed position; and at least one latching element for securing the base to the cover in the closed position.

16. The device of claim 15, wherein the cover comprises at least one opening for receiving an extension of the catheter.

17. The device of claim 1, wherein at least one of the plurality of teeth is made of metal.

18. The device of claim 1, wherein the plurality of teeth is insert-molded into the receiving area.

19. The device of claim 1, wherein the at least one opening is located in a center of the cover for receiving a tab or other extension of the catheter.

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